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ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

[SPECIAL OFFICIAL NOTICE.]

Bureau of Information, American Gas Institute.

DETROIT CITY GAS COMPANY,
ENGINEERING DEPARTMENT,
DETROIT, MICH., Nov. 26th, 1909.

To the Members, American Gas Institute: Send questions to be submitted to the Bureau of Information for answer to V. F. Dewey, Chairman, Gas Office Building, Detroit, Mich. The Bureau of Information respectfully solicits your troubles. Yours respectfully,

V. F. DEWEY, Chairman.

BRIEFLY TOLD.

ANNUAL REPORT OF THE ELECTRICAL DEPARTMENT OF THE DISTRICT OF COLUMBIA (1908-1909).—The ever increasing importance of public lighting in our great cities becomes more evident each year as we receive the various annual reports. They continue to increase in both bulk and value, and the latter characteristic is especially true of that of Mr. Walter C. Allen, Electrical Engineer of the District. For those who have not had the opportunity to visit the Capital recently, and see for themselves, the report makes it at once apparent that both the engineering and the artistic sides of public lighting are being capably handled, the latter being due to some extent, no doubt, to the fact that Mr. Allen examined, at first hand, the work along similar lines in the great cities of Europe a year or so ago. During the month of April, 1908, a large number of tests were made of various typical installations, and the complete records should be of considerable value for reference as to the performance of lamps in service rather than a true indication of the relative values of each type.[1] On July 1, 1909, there were 3,710 gas lamps, 1,538 naphtha lamps, 3,229 electric lamps and 452 street sign lamps, a total of 13,929.

ANNUAL REPORT OF THE STREET DEPARTMENT, CITY OF BOSTON, FOR THE YEAR 1908.—That the lighting controversy in the Hub is still an important matter is at once evident from the lamp division of the department presided over by Mr. Edward C. Wade. The various bids which were obtained for gas and electric lighting are given in detail, as well as copies of the contracts in force. The total expense entailed in the operation of the Department under the contract system is upwards of $800,000 per annum, which is a considerable saving over that under the former system, when the gas and naphtha lamps were cared for by municipal employees. A copy can be obtained from Mr. Guy C. Emerson, Superintendent of Streets.

A DIGNIFIED JUDICIAL DETERMINATION.—If further or added reason were necessary to prove that the Massachusetts Board of Gas and Electric Light Commissioners is fully up to the masterful handling of the many delicate questions which the Board is called upon to consider in the course of a twelvemonth, that further and added reason is shown in its recent determination of two delicate matters connected with the Chelsea Gas Light Company and the East Boston Gas Light Company. In the course of the ramifications of ordinary business it

1. AMERICAN GAS LIGHT JOURNAL, Jan. 25, 1909, p. 133.

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was determined by the proprietors of the named corporations that it would be good policy were their interests to be consolidated. To accomplish this certain new stock issues were necessary. A dispassionate hearing over the application resulted in the issuing of permission to make the stock allotment. Virtually, and at the same time, application had been made by certain disgruntled parties that both Companies should make certain reductions in their selling rates. A patient hearing having been given, the matter was adjusted by the Commissioners dismissing without prejudice the petition on these grounds. Having stated that both Companies are owned or controlled by the same interests which own the Boston Consolidated Gas Company, that the Chelsea Company has for a number of years purchased all of its gas from the Boston Company, and that the latter Company has recently laid a pipe line across Chelsea with the predetermined purpose of conveying gas to the East Boston Company, the Commissioners go on to say: "At the present time the Chelsea Company charges 95 cents net and the East Boston $1 net for gas supplied to their respective customers, and in the event of an approval of the proposed consolidation the representatives of the Companies have assured the Board that after consolidation the price will be reduced on January 1, 1910, to 90 cents net throughout the territory now supplied by the constituent Companies. At the hearings upon the complaints relative to the price of gas supplied by these two Companies the petitioners rested their contention chiefly upon the claim that they were entitled to the same price that is charged by the Boston Company. Many of the circumstances attending the relations of these Companies make this a natural demand. Their physical relations and their common ownership and management make them parts of the same general system, and make it reasonable to expect that in due time the present differences in price will entirely disappear. The Board believes that the management recognizes the force of the petitioners' demand, and is disposed to accede to it as promptly as business conditions will allow. The proposed consolidation, undertaken at the initiative of the managements, is one move in that direction, effecting, as it doubtless will, some savings through the maintenance of a single organization and a closer alliance with the Boston Company for both managerial and engineering purposes. While giving due weight to the intimate relations between the Companies in question, it is at the same time important to remember that the Board is compelled to recognize their claim to be considered as distinct corporate entities and to deal with them as possessing individually, unquestioned, constitutional rights. As already stated, certain savings may be confidently expected as the result of consolidation. Whether the new conditions will justify requiring a reduction in price beyond the substantial concession already mentioned can be definitely determined only after some experience with the united corporation."

NEW YORK COMMISSION'S RULES AND REGULATIONS GOVERNING TESTS OF GAS METERS.—The Public Service Commission for the Second New York District has issued, in pamphlet form, "Bulletin G. M.—1," which contains instructions to both their inspectors and the operating companies, and brief references to the statutes which cover meter testing. They have been prepared in a terse, readable style, and should greatly lessen any possible misunderstandings, especially if care is taken by the companies to place copies in the hands of those in charge of all shop and complaint work, as well as the men in the meter departments. They can be obtained from the Commission at headquarters, the Capitol, Albany, N. Y.

HANDBOOK BY THE WELSBACH COMPANY.—A very creditable pamphlet on "Illumination" has been compiled by Mr. Norman Macbeth, of the Welsbach Company, containing nearly 50 pages of pertinent matter, including numerous tables and illustrations. The superiority of gas as an illuminant, in matters of quality as well as cost, is well brought out, and short definitions of the simpler terms in "Illuminating Engineering" are given, along with some practical problems. The handbook can be obtained from the Welsbach Company's home headquarters, Gloucester, N. J.

CURRENT MENTION.—

A CORRESPONDENT in Denver, Col., informs us that, the evening of the 16th ult., Holy Trinity Church, Pueblo, Col., the Rev. W. J. Cordick officiating, Mr. William C. Duncan was joined in marriage to Miss Floretta M. Sherman. Mr. Duncan is Commercial Manager for the Pueblo Gas and Electric Company.

THE Tacoma (Wash.) Gas Light Company is extending its main system to the outlying settlement of Puyallup.

THE selling rates established by the proprietors of the Quebec (Canada) Gas Company, now that all competition has been put to flight, are: Gross, $1.50 per 1,000 cubic feet; net, $1.20, on account of payment within 10 days.

"T. D. R.," writing from Seattle, Wash., says: "Messrs. Seymour & Brewer, who, as your readers know, were recently awarded a franchise for the operation of a gas plant in the adjoining settlements of Chehalis and Centralia, Wash., are encountering some difficulty in securing a suitable site. The plant will be located in Chehalis. The Company has been organized with a capital of $190,000, and the above-named, with Messrs. George R. Osgood and G. R. Dysart, constitute the original Board of Directors. A forfeit bond, in the sum of $1,000, has been deposited with the authorities.

THE change in proprietorship of the Marshall (Tex.) Gas Company will not result in the displacement of the popular local Manager, Mr. W. H. Sedberry.

MR. EDWARD A. WAKEMAN, Manager of the Citizens Gas and Fuel Company, of Terre Haute, Ind., has been appointed General Superintendent of the Susquehanna Railway, Gas and Power Company. He is likely to be taken as the successor to Mr. E. E. Witherby in the Susquehanna corporation.

Bureau of Information, The American Gas Institute.

Under the direction of the Institute it has been decreed: 1. That the privilege of submitting questions be limited to members of the Institute. 2. Neither the Board of Directors of this Institute, nor the Institute as a body, make themselves in any way responsible for the statements of fact or expressions of view given out by the Bureau of Information.

BUREAU OF INFORMATION, THE AMERICAN GAS INSTITUTE,
HEADQUARTERS, GAS OFFICE BUILDING,
V. F. DEWEY, Chairman. DETROIT, MICH., Dec. 21, 1909.

Question No. 58.—"Is it common practice, in making specifications for the purchase of iron pipe, to insert a clause relative to the chemical composition of the pipe; if so, what chemical analysis should be required?"

ANSWER-AT-LARGE.

It is not a common practice in making specifications for the purchase of either cast iron, wrought iron or steel pipe to insert a clause relative to the chemical composition of the pipe, although it is sometime done, as, for instance, in the specifications for the riveted steel pipe used at Cambridge, Mass., under specifications drawn by the City's Chief Engineer, Mr. L. M. Hastings, which are published in the *Engineering News*, January 18, 1895. These specifications contain the following clause:

"The steel for plates used for the manufacturing of the pipe to be the class termed 'soft,' and shall be made by the open hearth process. It shall contain not more than $\frac{6}{10}$ per cent. of phosphorus, $\frac{6}{10}$ per cent. of sulphur, or $\frac{8}{10}$ per cent. of manganese."

It is also not customary to specify the chemical composition of cast iron pipe.

In the specifications laid down by the New England Water Works Association it is specified that all pipes and special castings shall be cast iron, of good quality and of such characteristics as shall make the metal of the castings strong, tough and of even texture and soft enough to satisfactorily admit of drilling and cutting. The metal shall be made without any admixture of cinder-iron or other inferior metal, and shall be remelted in a cupola or air furnace.

Except in rare instances, or in works of exceedingly great importance, or where the pipe is to be used for some special purpose, it would be inadvisable to specify the chemical composition of either cast iron, wrought iron or steel pipe, as it is very unlikely that manufacturers would accept such an order, except on the basis of increase in price, and it would then be necessary for the purchaser to arrange to have analyses made continually, in order to make sure that the pipe received is exactly as specified; and, finally, it is quite likely that if the iron mixture is specified by the purchaser he would have to take the responsibility of the resulting product. The following is an analysis of cast iron pipe which has proved to be very satisfactory in practice:

Constituents.	
Silicon	2.033
Sulphur	0.039
Combined carbon	0.90
Manganese	0.370
Graphite	2.47
Phosphorus	0.757

[Signed] J. D. VON MAUR, Superintendent,
" Laclede Gas Light Company, St. Louis, Mo.

Edited and approved by Committee in charge of Bureau of Information.—V. F. DEWEY, Chairman.

Modern Gas Lighting in the Store, Office and Home.[1]

By Messrs. Van Rensselaer Lansingh and Edward B. Rowe.

[An illustrated description of the Central Appliance House maintained by the Consolidated Gas Company in New York city.]

Progress and publicity are the passwords to continued success for any producer; and either of the two without the other means only partial returns, while the two other react to promote each other, and the effect on returns is cumulative. Progress is here intended to mean successive advances in the efficiency or quality of method material or article, and publicity might be defined as the honest exploitation of such advances between producers and to consumers. There can be no disputing the fact that, during the last 5 years marked progress has been made in the methods, materials and appliances connected with the production and utilization of artificial light.

Much of the credit for this advance is due to the Illumiuating Engineering Society. First, because it makes possible the free exchange, among physicians and engineers, of the results of investigations and experiments, and the fundamental data on which real improvement must be based; and, second, because its deliberations and discussions have forced those interested in or connected with the lighting industry to realize the importance of this fundamental engineering data. Furthermore, it has brought together many allied interests, which are all closely connected with the subject of artificial lighting and thereby give a publicity to the diversified phase of the subject which would not otherwise have occurred. This has all tended toward a better understanding of the problems connected with artificial illumination, and in a measure has educated the general public to appreciate and demand better illumination, not only in our streets and stores, but in our public buildings, offices and homes.

Realizing this fact, several companies have put in typical lighting installations to show what can be accomplished with up to-date equipment, and the company is so thoroughly convinced of the value of such installations in educating its customers and the general public to appreciate the results which can be obtained if the equipment is correctly designed and located for the purpose it is to serve, that an entire building is being used to illustrate by example the modern ways of lighting the store, office and home.

The Consolidated Gas Company, of New York, remodeled the four-story and basement building at No. 29 East 21st Street, New York, to serve as display rooms for the numerous gas appliances on the market, and to contain, also in a model apartment, a full-sized exhibition of what could be accomplished by gas for lighting, heating and cooking in the home. As the upper floors are devoted to general office work, an opportunity was presented of combining in the one building examples of display window, store, office and home lighting. The plan was conceived by Mr. Walter R. Addicks, and has been carried to a successful completion under his direction. The immediate supervision of the work was under Mr. H. B. McLean, in charge of the Appliance Department. Mr. H. J. Hardenbergh was the architect and Mr. V. R. Lansingh the Consulting Illuminating Engineer for the Company.

Measurements were taken of the illumination and the illuminometer and other instruments used in the tests were calibrated at the Electrical Testing Laboratories, and no adjustments of burners for maximum incandesence, pressure, consumption, etc., were made, the lighting equipment in all parts of the building being in the normal operating condition in which it is kept by regular attendance and maintenance. The lighting system has been in operation for 5 months or more, and it can be assumed that the results here found will apply to any installation which is being regularly maintained. Pressures were measured by U-tube manometer, and gas consumption taken from the meters installed—a separate meter being provided for each floor. A sufficient interval of time was taken on each test to allow readings to be taken with fair accuracy.

The windows are lighted by means of inverted gas burners, and the measurements showed that the average foot candles on a plane 6½ inches above the floor were no less than 32.1.

In viewing the interior of the store shown in Fig. 1, one is immediately impressed with the complete and attractively arranged display of the innumerable gas appliances now available for domestic use. The stoves and ranges are placed along the sides of the room, with the smaller articles on tables at the rear.

1. Abstract of paper read before the joint meeting of the National Commercial Gas Association and the New York Section, Illuminating Engineering Society, Madison Square Garden, Dec. 17, 1909.

As was necessary with such dark goods displayed, the color scheme is light, the sidewalls straw, the ceiling white. Owing to the extreme length of the room, and the consequent poor daylight illumination at the middle, some artificial light is necessary the greater part of the time, and the illumination from the 4-light gas fixtures seems to blend perfectly with the daylight illumination from the windows. The fixture used on this floor is a special 8-light combination, 4 gas 4 electric. The gas equipment being the reflex lamp with holophane satin finish distributing reflector, and clear inner cylinder, while the electric equipment consists of bowl-frosted, 40-watt tungsten lamps and the same distributing reflector.

There is a certain popular preference for gas lighting in the winter and electric lighting in the summer. The usual practice in such cases is to employ separate outlets and equipments that do not harmonize in the least and serve to give the impression of a room full of lighting fixtures. Combination fixtures of the kind illustrated here, besides being a well-balanced, harmonious whole, also afford the maximum attainable efficiency of both illuminants, with a considerable range in the choice of glassware available. This is just as true of fixtures for upright gas and electric equitment, except that the maximum attainable efficiency, meaning by that the lumens on the desk plane per cubic foot of gas per hour or per watt, are somewhat less than for pendant units, which is to the practical impossibility of designing glassware the redirection of which will fully compensate for the loss of light caused by supporting the light source and glassware from below. To obtain certain desired effects, however, this slight loss, and even a very considerable one, is often warranted.

This seems a particularly good opportunity to call attention to the great similarity of the two light units on this fixture from the customer's standpoint. The source of light is both cylindrical in shape, of approximately the same outline dimensions, inclosed in glass bulbs and supported from a holder or socket. Both can be lighted by the pull of a chain, or the push of a button, and can be extinguished in the same way. The same types and kinds of glassware can be used with both and similar distributions obtained. When they burn out, the source is thrown away and a new one purchased by the consumer, or, in the case of carbon lamps supplied by the Company which furnishes energy for the lights. The new gas mantle, of course, must be adjusted for maximum incandescence, but this is comparable in a way to selection for average voltage in the case of electric units, and satisfactory operation is dependent on this adjustment or selection in either case.

The general shape of the street floor and the location of outlets and test stations are shown in Fig. 7, and a graphical representation of the variation in foot-candle intensity obtained is shown in Fig. 11 The illumination figures are as follows:

Observed Horizontal Illumination Values.

First Floor			
Line 1—9		Line 2—1	
Station.	Foot-Candles.	Station.	Foot-Candles.
1	1.55	2	3.03
4	2.91	3	7.18
5	3.26	6	6.23
8	3.62	7	7.74
9	3.60	10	7.32

Supplementary Data.

Maximum dimensions of room	91 ft. by 23 ft.
Height to ceiling	12 ft.
Height to mantles	10 ft.
Height to test plate	2 ft. by 9 in.
Height of mantles above test plate	7 ft. by 3 in.
Number of outlets	7
Number of burners per outlet	4
Total number of burners	28
Total gas consumption, cubic feet per hour.	93
Average consumption per burner	3.3
Pressure, inches of water	1.5
Total area of floor, square feet	1,745
Cubic feet of gas per square foot	0.053
Number of test stations	10
Average foot-candles	4.64
Lumens per cubic foot of gas	87.5

The efficiency, therefore, checks very closely with previous determinations.

We come now to the model apartment (plan Fig. 8), the general arrangement of which is here shown. A very unique daylight effect is obtained in the dining room, the two windows being boxed in, the interior of the space being painted a matte white. Three standard, upright, mantle burners are placed between the windows as indicated, which are controlled by pneumatic buttoms located side of windows,

Pink "Rambler" roses cover a trellis just outside the window and the deception is quite successful.

Stepping out of the elevator we enter the reception room. In one corner is located the telephone exchange and, in addition to this convenience, there will be found writing materials, current literature, etc., and comfortable chairs while resting or awaiting friends. The color scheme in this room is dark green, the walls, wicker furniture and carpet being of this shade, with the door and window trim and ceilings in white. The lighting equipment consists one 8-light and one 2-light fixture, and two 1-light side brackets, all with inverted mantle burners and art glass globes. Several baseboard outlets are also provided.

In the reception room, near the telephone exchange, is located a new portable form of instrument for color comparison under different illuminants. This has been called a "sochrodometer," a word derived from solar (relating to the sun), chromatic (pertaining to color) osendo (signifying false) and comparimeter, therefore, meaning false comparison of sun colors. Either end of the instrument can be placed against a window to obtain the daylight standard, and the colors travel through the successive compartments on an endless belt. Provision is made for attaching to this belt any fabric or color which a visitor may wish to try under any particular illuminant, or to compare under the different illuminants.

Between the reception room and library, on either side of the passage, are located booths or small rooms for demonstrating the great effect of color of walls on the illustration on any given plane produced by any given light unit. Each booth is lighted by one inverted mantle burner with clear distributing reflector and clear cylinder in the center of the ceiling. Control is pneumatic from push-button on wall. The curtains for the booths are all faced on the inside with material of the same shade as the wall paper, and the colors adopted for the latter are as follows:

No.		No.		No.	
1	Salmon.	3	Cream.	5	Blue.
2	Red.	4	Green.	6	Cream.

The wall papers are of nearly the same texture, and any difference in the illumination obtained can be considered as due to absorption by color alone. Readings were taken in each of the booths 1 to 5 to obtain some comparative figures for this absorption. In each booth the mantle was adjusted to give, as nearly as possible, the same candle power value directly below the center of the lamp, as measured by the illuminometer used as a photometer. Since the equipment was the same in all the booths, the distribution and total flux of light would be approximately the same when the candle powers at any one angle were equal. Then with the illuminometer disc two feet six inches from the floor, foot-candle values were obtained at the point directly beneath the lamp as follows:

No.	Color.	Foot-Candles.	Pr. Ct. of No. 1.
1.....	Salmon.	3.34	100
2.....	Red.	1.87	56
3.....	Cream.	2.93	88
4.....	Green.	1.67	50
5.....	Blue.	2.36	71

Not only does the intensity vary greatly with the color of the paper, but the character of the reflected light is quite different. This was very noticeable in making the illuminometer settings, where the color of the two fields in the prism varied greatly in the different booths. It may be interasting to note here that very nearly a perfect color match was obtained in the test in Booth No. 1, which showed the highest foot-candle reading. In a measure these readings, as are all illuminometer readings, in fact, are only indicative, since so much depends on the personal equation in setting for a color match rather than for intensity, a matter which received attention in Mr. P. S. Millar's recent paper on "Heterochrome Photometry." The question of light absorption by color, and its effect on efficiency, as well as its physiological and psychological importance, certainly justify the illustration and explanation of these color effects to the general public, and the method of accomplishing this which is here illustrated deserves very favorable comment. The effect of different illuminants on the same colors has been repeatedly demonstrated, but this is the first instance that we know of where the effect of *one* illuminant on *different* colors has been given prominence.

We pass now to the library (Fig. 3), a room richly and appropriately furnished and decorated. The furniture is in old English oak, as are also the wall paneling and the beautifully carved mantle. The latter deserves particular comment. It is Elizabethan in style, as is the whole room, and was designed and executed especially for this room under the supervision of Mr. Huntting, of Mr. H. J. Hardenbergh's office. It emphasizes the great expenditure of both time and money that has been made to have this model apartment second only to the ideal.

The lighting fixtures were all designed for the room and are very will illustrated in the photograph. On the mantle are two small standards (quite a departure from the customary side brackets) equipped with small upright mantles completely concealed by amber glass set in hammered bronze. The portable table shown at the left is a larger edition of the mantle fixtures, with a standard upright mantle. The center dome is not only very attractive but performs its lighting functions quite efficiently. The gas is brought into the dome through one of the supporting rods and fed to a standard, inverted mantle burner, equipped with distributing reflector, which, while allowing sufficient light to pass through to illuminate the amber glass, redirects most of the light uniformly over the ground glass plate closing the bottom of the dome. Glare is, therefore, entirely eliminated, and at the same time the required reading intensity is provided at any part of the table.

In the center of the library may be noticed a specially designed bookcase portable. Such a lamp could be used as a piano lamp or for similar purposes. The same shade without the base is used in this room for the side brackets, which do not appear in the photograph. Baseboard outlets are provided for other portables.

Adjoining the library is the bathroom, done in tile and marble, with porcelain and nickel fittings. The light units are placed, one on either side of the mirror, and consist of Welsbach "Junior" mantle burners with holphane upright globe No. 2,404, on nickel fixtures. The diffusion is such that glare is entirely eliminated, and the distribution, combined with the high reflection from the walls, etc., of the room, gives altogether satisfactory results.

After admiring the bath, we go back through the library into the dining room, shown in Fig. 4, where the design is Colonial, the wall paper and rug being in blue. The woodwork is of white, with the furniture of mahogany. The single lamp brackets are from the "lamp" motif, the chief feature of lighting in the Colonial period, while the dome is also a Colonial adaptation. A recent issue of the New York "Illuminating Engineer" had to say on this subject: "To preserve the atmosphere of Colonial times not only must the structural features faithfully express the architectural types of those days, but the furnishings, including the lighting fixtures, likewise follow the prevailing taste of the same period. The methods of illumination at that time were oil lamps and candles. The former made use of the glass shade, and for decoration glass prisms and jewels were the common means employed." In each side bracket one, and in the dome four, junior unright mantles are used. Several baseboard outlets are provided for the chafing dishes and percolators, the method of attachment being shown in the photograph.

We pass from the dining room through the pantry to the kitchen, shown in Fig. 2, the only feature of the pantry lighting deserving special comment being the small inverted mantle burner over the sink, where good light is quite essential. A standard upright mantle, with opal dome and bobesche, is provided for the general illumination.

Like provision is made in the kitchen, a standard mantle, inverted, with opal cone shade being placed near the sink, and also a baseboard outlet, from which the adjustable bracket outlet under the hood of the range is fed. Similar equipment is provided for the other range and over the small tables in the room. The central ceiling outlet is equipped with a 2-light reflexolier, with satin-finish, holophane distributing reflectors. A relatively large number of outlets in the kitchen seems to be justified when we consider that it is here that our food is prepared. Unclean food, or plates served in the dining room, would certainly not pass unnoticed. Why not then provide an abundance of light in the kitchen, properly distributed where it is most needed, so that such occurences will be prevented? Such a procedure seems perfectly logical, yet the kitchen lighting is far too often left to a single ceiling outlet, generally improperly equipped.

Desk lighting is still one of the unsolved problems of illuminating engineering; meaning by this, that no one standard method is universally satisfactory.

The individual lighting of each desk was for a number of years, and still is (to a certain extent) quite satisfactory; but it is a method which has numerous serious objections, particularly from the gas man's point of view. There has been developed recently, however, an electric equipment which has been shown by numerous tests to satisfactorily replace the individual desk lamps and which overcomes

Fig. 1.

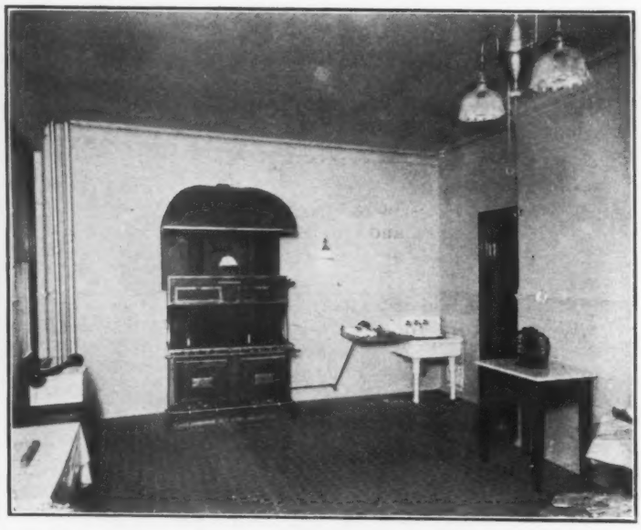


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

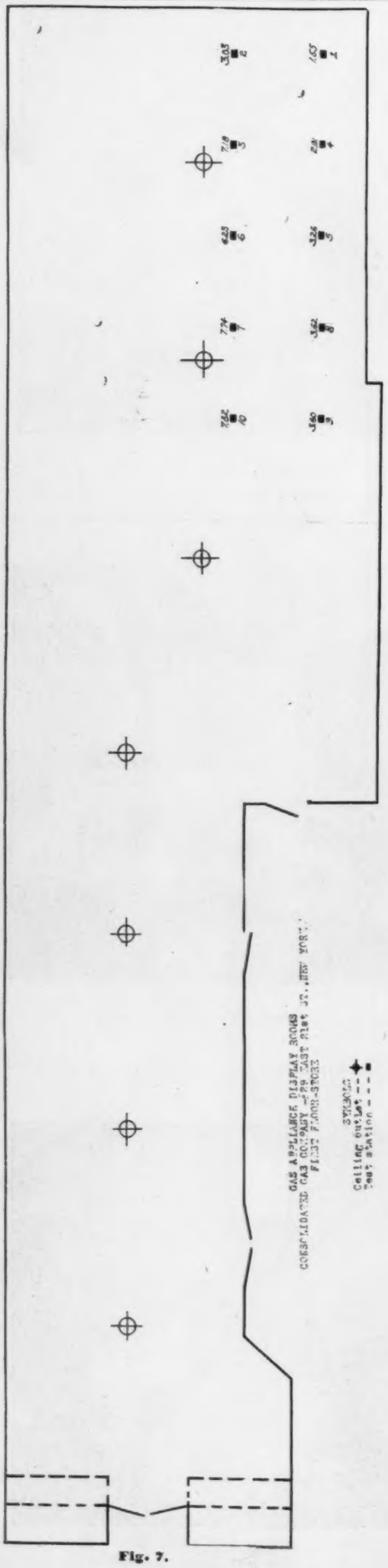


Fig. 7.

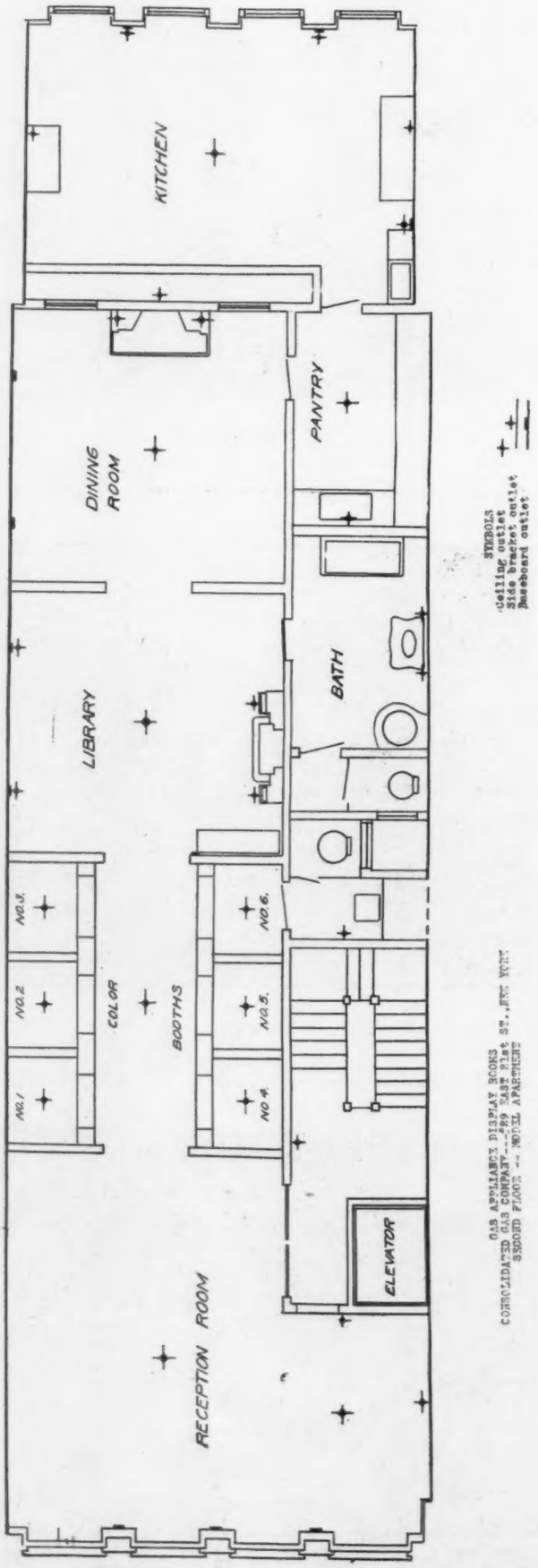

KITCHEN
PANTRY
DINING ROOM
BATH
LIBRARY
COLOR BOOTHS
NO.1
NO.2
NO.3
NO.4
NO.5
NO.6
RECEPTION ROOM
ELEVATOR

Fig. 8.

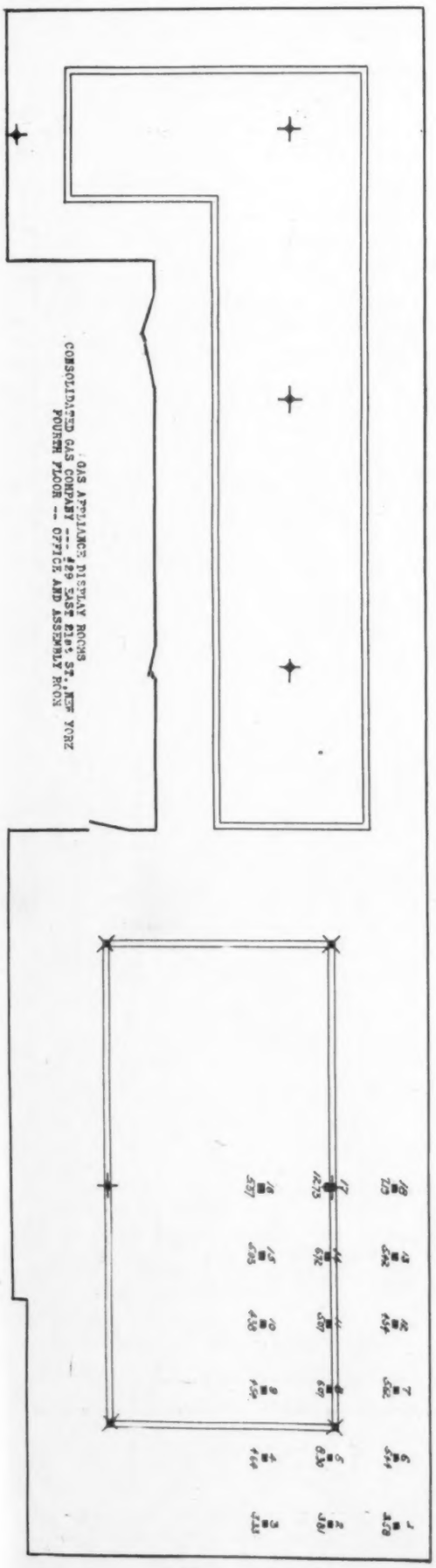

CONSOLIDATED GAS APPLIANCE DISPLAY ROOMS
CONSOLIDATED GAS COMPANY --- 489 EAST 21st ST., NEW YORK
FOURTH FLOOR -- OFFICE AND ASSEMBLY ROOMS

Fig. 10.

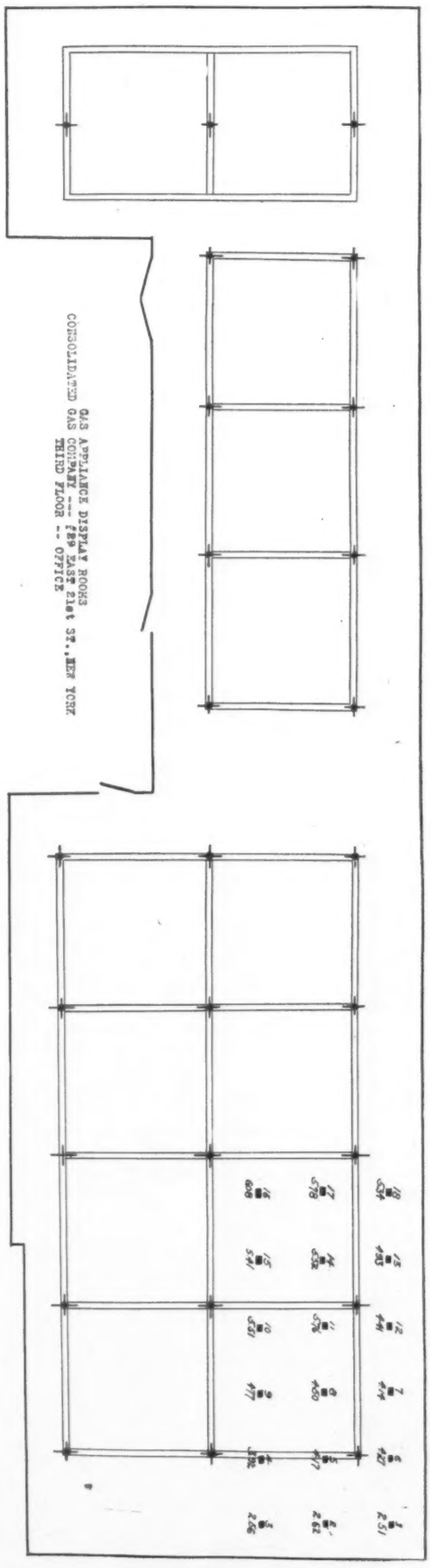

CONSOLIDATED GAS APPLIANCE DISPLAY ROOMS
CONSOLIDATED GAS COMPANY --- 489 EAST 21st ST., NEW YORK
THIRD FLOOR -- OFFICE
Ceiling outlet
Floor station
SYMBOLS
SECTION OF PANEL MOLDING

Fig. 9.

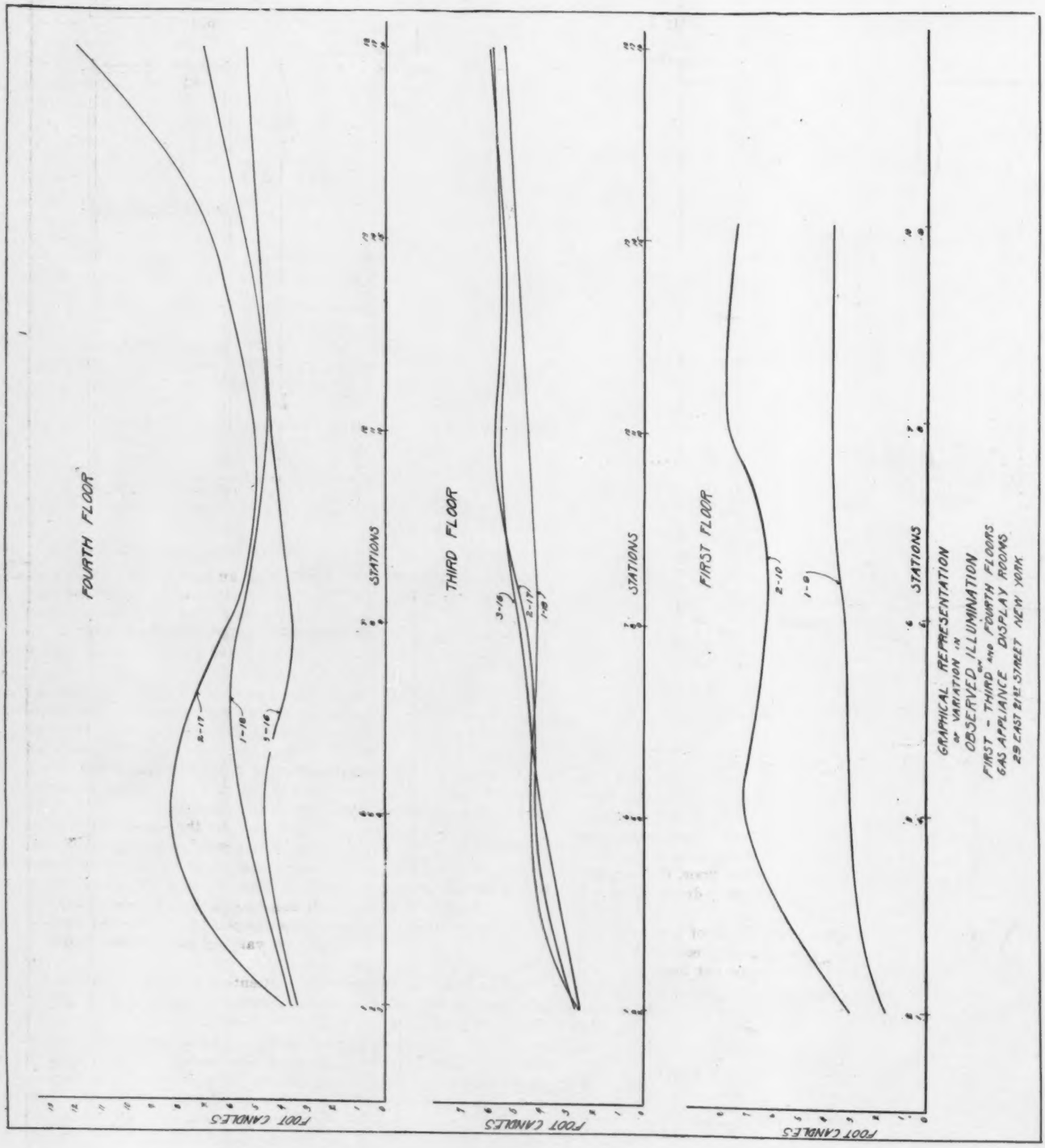

FOURTH FLOOR
THIRD FLOOR
FIRST FLOOR
STATIONS
FOOT CANDLES
GRAPHICAL REPRESENTATION
OF VARIATION IN
OBSERVED ILLUMINATION
FIRST - THIRD AND FOURTH FLOORS
GAS APPLIANCE DISPLAY ROOMS
29 EAST 21ST STREET NEW YORK

Fig. 11.

many of the objections to the latter. This has been called a "distributed unit system," and the illustration (Fig. 5) shows what is undoubtedly the first installation of such a system, using gas. Numerous difficulties had to be overcome in this particular instance before it was certain that the proposed equipment could be put in. The greatest of these difficulties was the impossibility of running piping between the ceiling and floor above, making it necessary to use the old ceiling outlets. Mr. W. R. Addicks conceived the idea of forming panels on the ceiling which would cut through these outlets, thereby making it possible to score the ceiling slightly for the pipes and conceal these in wooden molding connecting the proposed outlets and forming the panels. This was done, the molding shown in cross section on the plan (Fig. 9) being designed to harmonize with the border molding of the room.

Twenty-six outlets were provided, as shown in the plan, each being equipped with a single Welsbach reflex lamp and holophane, satin finish distributing reflector, with clear inner cylinders. Pneumatic control from wall buttons is provided and has proved to be positive and reliable in service, with practically no attention required after it is once adjusted properly, provided it is not attempted to control too many lights from one button. On this floor the outlets are controlled in 3's in the rear of the room and in 2's at the front.

To determine the illuminating efficiency of this type of equipment, readings were taken at the 18 stations shown on plan (Fig. 9), it being assumed that the average of these stations would give a fair average for the entire room.

Observed Horizontal Illumination Values.—Third Floor.

Line 1—18		Line 2—12		Line 3—16	
Station.	Ft-Candles.	Station.	Ft-Candles.	Station.	Ft-Candles.
1	2.51	2	2.62	3	2.56
6	4.27	5	4.17	4	3.92
7	4.14	8	4.50	9	4.77
12	4.41	11	5.78	10	5.51
13	4.93	14	5.52	15	5.41
18	5.34	17	5.78	16	6.08

Supplementary Data.

Maximum dimensions of room	84 feet by 22 feet
Height to ceiling	10 feet 2 inches
Height to mantle	8 feet 7 inches
Height to test plate	2 feet 9 inches
Height of mantle above test plate	5 feet 10 inches
Number of outlets	23
Number of burners per outlet	1
Total number of burners	26
Total gas consumption cubic feet per hour	83.4
Average consumption per burner	3.2
Pressure, inches of water	1.6
Total area of floor, square feet	1,680
Cubic feet of gas per square foot	0.05
Number of test stations	18
Average foot-candles	4.57
Lumens per cubic feet of gas	92.1

The illuminating efficiency agrees well with the constants derived from similar installations, and the illumination, it will be noted, is quite uniform, the maximum deviation from the mean, which occurs at Station No. 1, in the corner, being only 45 per cent. It is interesting to notice, in the photograph of the office floor, the manner in which the illumination gradually and uniformly drops off from the floor, up the side walls to the ceiling.

Comparing this with the photograph (Fig. 6) of the floor above, the difference is very marked—note the spotted effect on floor, walls and ceiling on the fourth floor. The equipment here is a 4-light Reflexolier with opaline balls, the outlets being located, as shown on plan, Fig. 10. In the illuminometer test on this floor the same test stations were used as on the office floor below. The results of this test are as follows:

Observed Horizontal Illumination Values.—Fourth Floor.

Line 1—18		Line 2—12		Line 3—16	
Station.	Ft-Candles.	Station.	Ft-Candles.	Station.	Ft-Candles.
1	3.58	2	3.81	3	3.33
6	5.44	5	8.30	4	4.64
7	5 62	8	6.07	9	4.54
12	4.54	11	5.07	10	4.38
13	5.42	14	6.72	15	5.03
18	7.19	17	12.73	16	5.37

Supplementary Data.

Maximum dimensions of room	84 feet by 22 feet.
Height to ceiling	10 feet 2 inches.
Height to mantles	8 feet 2 inches.
Height to test plate	2 feet 9 inches.
Height of mantles above test plate	5 feet 5 inches.
Number of outlets	9
Number of burners per outlet	4
Total number of burners	36
Total gas consumption, cu. ft. per hour	126
Average consumption per burner	3.5
Pressure, inches of water	2.2
Total area of floor, square feet	1,680
Cubic feet of gas per square foot	0.075
Number of test stations	18
Average foot-candles	5.65
Lumens per cubic foot of gas	79.4

Compared with the distributed unit system, this equipment shows a maximum deviation, at Station No. 17, of 125 per cent., as against 45 per cent., and, as would be expected, the lumens per cubic foot per hour are much less—79.4 as against 92.1. The pressure on the fourth floor, it will be noted, is 2.2, as against 1.6. However, the diffusion is as good with the opal one as with the satin-finish holophane.

Fig. 11 shows the graphical representation of the variation in illumination on the first, third and fourth floors at the stations taken on these respective floors. The installation on the street floor was not designed for uniform illumination particularly, the old outlets being utilized. On the third or office floor, however, where uniformity was desired, the tests seem to show very satisfactory results. It might be stated that the bookkeepers on this floor, who work by artificial light the greater part of the time, have offered not a single objection to the system.

[Continued from Vol. XCI., Page 1394.]

REPORT OF PROCEEDINGS, FOURTH ANNUAL MEETING, AMERICAN GAS INSTITUTE.

Held in the Hall of Elks, Detroit, Mich., October 20, 21 and 22, 1909.

First Day—Morning Session.

The Chairman introduced Mr. John D. Shattuck (Chester, Pa.) who read the following

REPORT FROM COMMITTEE ON BENZOL ENRICHMENT.

On investigating the use of benzol as an enricher of illuminating gas, your Committee finds that, as the result of its being manufactured mainly in by-product oven plants, by far its most important use in this country as an enriching material has been to raise the candle power of the coal gas obtained in the manufacture of coke in by-product ovens.

The companies manufacturing by-product oven gas have made a careful study of the practical conditions governing the enrichment of their product by the use of commercial benzol, and the communications received from Mr. Warren S. Blauvelt, at Detroit, and from Mr. L. M. Whitwell, at Milwaukee, Wis., both of the Semet-Solvay Company, give some of the results of such study. These communications are attached to this report as an appendix.

Perhaps the most important work done by the Semet-Solvay Company has been the confirmation, in practical work, of Dr. Bunte's figures, showing the varying enrichment value realized from benzol in candle-feet per gallon depending upon the quantity of benzol carried by the gas. Mr. Whitwell describes in a most instructive way the experiments made to determine this point, and adds practical examples and charts illustrating the varying possibilities of enrichment with benzol.

It is important to call particular attention to the fact that enrichment by benzol adds but little to the heating value of the gas enriched. The addition of .1 gallon of benzol to 1,000 cubic feet of gas increases its heating value by only about 12 B.T.U. even when no low tension vapors are thrown down; and, since the heating value of gas is today at least as important as its candle power, the first essential for the successful use of benzol enrichment is that the gas must already have a satisfactory thermal value. For this reason benzol can never entirely replace gas oil for the enrichment of water gas; the approximately 1 gallon of benzol required to raise 1,000 cubic feet of blue water gas to 21 or 22-candle power would only raise the heating value to about 425 B.T.U. per cubic foot. On the other hand, coal gas, whether made in coke ovens or in retorts, is comparatively low in candle power, but possesses the necessary initial heating value to make it suitable for enrichment by benzol.

Benzol may have an important use as an enricher for water gas in cases where sufficient oil has been used in the manufacture of the water gas to give it the necessary heating value, but where the can-

dle power has been reduced by the loss of hydrocarbon vapors due to cooling or compression.

Practical results confirm theory in condemning the use of benzol to enrich at the works any gas already saturated with hydrocarbon vapors; the low tension vapors will be deposited in transmission to a greater or less extent, depending upon the temperature and pressure conditions, and the final candle power reaching the consumer is likely to show that a very disappointing enriching value has been realized for the benzol used.

The Committee has received a report from one works manufacturing ¼ water gas and ¾ coal gas, covering a full year's use of benzol to replace a portion of the gas oil formerly used. The enriching was done at the works and the report shows an average enriching value of about 28,000 candle feet per gallon of benzol.

However, as the quantity of street drip was increased by the use of benzol, it is probable that the enrichment value, measured by the candle power at point of consumption, was much less than that shown by the works candle power readings.

To insure a permanent and commercially successful increase in candle power by the use of benzol, it is usually necessary to prepare the gas by removing a portion of the low tension hydrocarbon vapors. This may be done by compression, by cooling or by washing the gas with an absorbent oil.

Mr. Blauvelt's paper, given in the Appendix to this report, describes the latter method as carried out at Detroit, and Mr. Whitwell gives the results obtained at Milwaukee in the enrichment of coke oven gas after compression to 1½ to 2 pounds.

The conditions controlling the commercial success of benzol enrichment are the comparative costs of benzol and gas oil, and the quality of benzol available; the initial candle power and heating value of the gas to be enriched and its condition with respect to saturation with hydrocarbon vapors and the character of such vapors; the conditions of temperature and pressure to which the gas will be exposed after enrichment. These factors having been determined, there are enough data available, both practical and theoretical, to make it possible to give a close estimate of the probable results to be obtained by enrichment with benzol.

The Committee desires to emphasize its conviction that there are many cases were enrichment by benzol has practical and economic advantages over any other method of enrichment, but that each case constitutes a separate problem requiring careful study.

E. H. Earnshaw,
W. S. Blauvelt
V. F. Dewey,
L. M. Whitwell, } Committee.
W. H. Snow,
A. C. Wilke,
J. D. Shattuck,

Submitted by Mr. L. M. Whitwell, Semet-Solvay Company, Milwaukee, Wis.

In working with benzol enrichment widely varying results have been obtained by different operators and different companies as to enriching values realized. It is, of course, upon the enriching value realized that the success of benzol enrichment depends. There appear to be two general reasons for the wide variation in results: First, the amounts of benzol retained by gas have been different under different conditions. Consequently wide variations in enriching values have been realized. Second, the quantity of benzol present before enrichment, as well as the amount added, materially affects the enriching value which is possible.

Upon the vapor tension of benzol is based the whole theory of benzol enrichment. Quite as important as the vapor tension of the benzol, which is used for enrichment, is the vapor tension of the oil mixture present in the initial gas before enrichment. In coal gas the oil mixture present in the gas before enrichment is largely benzol. Mr. E. H. Earnshaw explained most clearly the laws of vapor tension as applied to benzol enrichment, in his paper read before the American Gas Institute and published in the "Proceedings," 1908, p. 247; therefore the theoretical side of the subject will not be discussed here, although later some phases of the application will be taken up. To anyone interested in benzol enrichment a very careful study of Mr. Earnshaw's paper is recommended, inasmnch as the laws explained in this paper must be thoroughly understood if the best results are to be obtained with this process of gas enrichment.

Distinct from the capacity of gas to carry benzol, which is dependent upon the vapor tensions, is the candle power, which can be obtained when oils of this series are retained. It is, of course, impossible to predict what results will be obtained with benzol enrichment if the vapor tension of the oil mixture present in the gas before enrichment, of the enriching benzol used, or of the mixture of the two, is such that any of the oils will not be retained under the temperature and pressure conditions to be met. Therefore, it is of value to consider what candle powers can be realized, provided benzol is retained by the gas. Later on, various methods will be discussed which are applicable for the production of oil mixtures which will be retained.

To determine the candle power results realized per unit of benzol reaching the burner under commercial conditions, the following work was done: At the Semet-Solvay Company's operations, at Milwaukee, Chicago and Detroit, in various stations, ranging from 100 yards to 15 miles from the works, oils (benzol) present in the gas were extracted and carefully measured per unit of gas. Candle power determinations were made before and after extraction of the benzol, and the difference taken as candle power due to oils (benzol). Gases varying from 8 to 20-candle power were worked with. Tests were made on unenriched gas at the works; on gas immediately after enrichment; and on gas after transmission under both low and high pressures. The general character of the gases is shown by the following analyses:

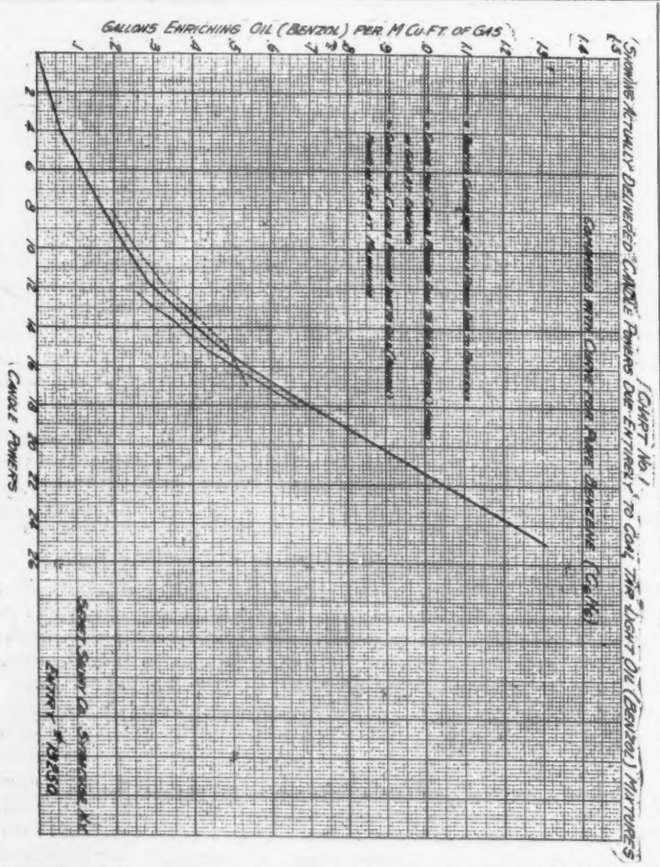
	Chicago.	Milwaukee.	Detroit.
CO_2	2.2	1.8	1.4
C_nH_n	1.1	2.5	1.7
C_nH_n	4.0	2.3	3.4
O_2	0.4	0.7	0.4
CO	3.9	4.5	4.4
H_2	50.2	42.7	48.4
CH_4	35.6	37.6	36.0
N_2	2.6	7.9	4.3
	100.0	100.0	100.0
B.T.U. by Junkers calorimeter	655	650	654

It may be well to mention at this point that, as far as the study has been pursued, no definite relation has been established between candle power and the per cent. of "illuminants" (either C_nH_n series or C_nH_n series), as determined by ordinary gas analysis methods. This is mentioned as a precaution against trying to made candle power results comparable with gas analyses. It has been published at times that a certain per cent. by volume of benzol is equivalent to certain candle power. This is unquestionably true, but, owing to the uncertainty of analytical methods, this is an unreliable basis on which to work. The gas was made in Semet-Solvay coke ovens as a by-product in the manufacture of metallurgical coke. The results of the tests, in candle power due to various contents of benzol, are shown in the attached Chart No. 1, and also Table No. 1.

In the *Journal Für Gasbeleuchtung*, 1893, p. 442, Dr. Bunte publishes results of some of his work on the illuminating value of benzol with coal gas. This data has been transposed into terms of candle power per gallon of benzol per 1,000 cubic feet of gas, and a curve plotted therefrom is shown on Chart No. 1, together with the results obtained at Detroit, Chicago and Milwaukee in commercial practice on a large scale. The results with the coke oven gas are found to parallel very closely Dr. Bunte's work. As the curve for Dr. Bunte's work represents very nearly an average of the conditions found in actual practice, and as his work was probably more accurately executed, it is considered that this curve represents the candle power which can be realized per unit of benzol carried to the burners with gas of this character. Attention is called to the rapidly decreasing candle power realized per unit of additional oil.

.1	gal.	per	1000	yields	5.5	C. P.	= 5.5	C. P. per unit of benzol.
.2	"	"	"		9.0	"	= 4.5	" " "
.3	"	"	"		12.0	"	= 4.0	" " "
.4	"	"	"		14.0	"	= 3.5	" " "
.5	"	"	"		15.5	"	= 3.1	" " "
.6	"	"	"		16.8	"	= 2.8	" " "
.7	"	"	"		18.0	"	= 2.6	" " "
.8	"	"	"		19.0	"	= 2.4	" " "

From the curve showing the candle powers for the various contents of benzol, which curve was substantiated in actual practice, the amount of benzol which it is necessary to add to a gas of known candle power, in order to produce a desired enr chment, can be obtained, provided that it is known what proportion of the candle power of the gas to be enriched is due to benzol. If this proportion is not known the amount of benzol required for certain candle power increase may vary as much as 100 per cent. Therefore, the result of


GALLONS ENRICHING OIL (BENZOL) PER M CU. FT. OF GAS
(CHART No. 1.) SHOWING ACTUALLY DELIVERED CANDLE POWERS DUE ENTIRELY TO COAL TAR LIGHT OIL (BENZOL) MIXTURES
CANDLE POWERS
CHANGED INTO CANDLE POWER BENZENE (C6H6)
SCIENTIFIC GAS APPARATUS CO. SYRACUSE, N.Y.
PATENT APPLIED

benzol enrichment, even when the vapor tensions are such that the oil is satisfactorily retained, will vary with the oil content of the gas

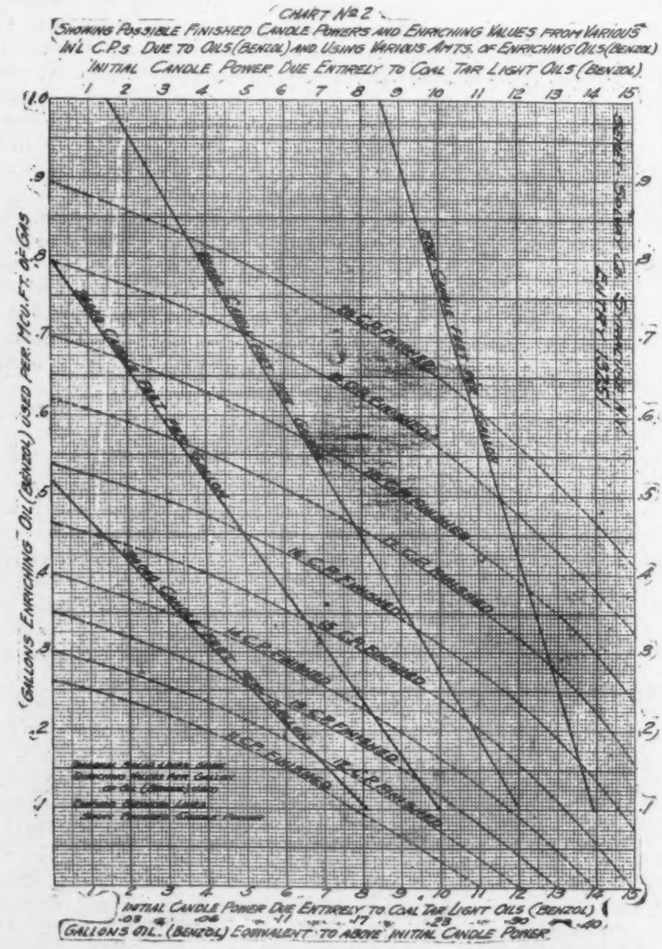


CHART No. 2
SHOWING POSSIBLE FINISHED CANDLE POWERS AND ENRICHING VALUES FROM VARIOUS INITIAL C.P.S DUE TO OILS (BENZOL) AND USING VARIOUS AMTS. OF ENRICHING OILS (BENZOL)
INITIAL CANDLE POWER DUE ENTIRELY TO COAL TAR LIGHT OILS (BENZOL)
(GALLONS ENRICHING OIL (BENZOL) USED PER M CU. FT. OF GAS
SCIENTIFIC GAS APPARATUS CO. SYRACUSE, N.Y.
INITIAL CANDLE POWER DUE ENTIRELY TO COAL TAR LIGHT OILS (BENZOL)
GALLONS OIL (BENZOL) EQUIVALENT TO ABOVE INITIAL CANDLE POWER.

to be enriched as well as with the amount of enrichment desired. In other words, it is dependent upon the total oil content.

To bring out the various possibilities of benzol enrichment Chart No. 2 and Table No. 2 are presented in which it is aimed to show the amount of enriching benzol required to produce various finished candle powers due to benzol, from various initial candle powers due to benzol Chart No. 2 is entirely an adaptation of Chart No. 1 which is based upon actual practice.

In Chart No. 2 the vertical lines show initial candle powers due to oils only. The broken curved lines show finished candle powers due to oils only. Horizontal lines from the intersections of the vertical lines and the broken curved lines show the amount of oil required for any given condition.

TABLE NO. 1.—*Showing Candle Power Actually Produced Per Unit of Benzol Retained by Gas.**

Gallons Benzol per Cu. Ft. Gas.	Milwaukee.	Candle Power. Bunte.	Detroit and Chicago.
.05	....	3.0	....
.10	....	4.6	....
.15	....	7.4	....
.20	8.0	9.0	...
.25	9.8	10.4	12.0
.30	11.4	12.0	12.9
.35	12.4	12.9	13.6
.40	13.4	13.9	14.4
.45	14.3	14.7	15.2
.50	15.4	15.4	15.8
.55	17.4	16.1	16.4
.60	....	16.7	17.1
.65	....	17.4	17.8
.70	...	18.0	....
.75	....	18.5	....
.80	....	19.1	....

* Table No. 1 is identical with Chart No. 1.

To illustrate the point which it is aimed to bring out by this chart, assume that it is desired to raise a 10-candle power initial gas to 18-candle power, and that the 10 initial candle power is entirely due to oil (benzol). In other words, the initial gas free from benzol is practically blue gas. Chart No. 2 shows that .465 gallons of benzol per 1,000 cubic feet are required, from which benzol 17,200-candle feet per gallon can be realized. However, if the 10,000-candle power in the initial gas is made up of 5-candle power due to oils (benzol) and 5-candle power due to true gases (ethylene, etc.), the problem is then to raise 5-candle power due to oil to 13-candle power due to oil. The resulting gas will be composed of 13-candle power due to oil and 5-candle power due to true gases (ethylene, etc.), making a total of 18-candle power. To raise 5-candle power due to oil to 13-candle power due to oil, Chart No. 2 shows .210 gallons of benzol per 1,000 cubic feet of gas required, from which benzol 38,000-candle feet per gallon can be realized. Thus, in the second case, it is observed that only 45 per cent. as much oil is required as in the first place to accomplish what is apparently the same work; namely, to raise a 10-candle power gas to an 18-candle power gas.

It is to be remembered that this example, or any case taken from Chart No. 2, as to the amounts of benzol required is based on the benzol actually found in gases of the stated candle powers under widely varying commercial conditions. Some further examples illustrating the use of Chart No. 2, may make the varying possibilities of benzol enrichment more thoroughly understood.

Various Possibilities for Producing 16*-Candle Power Gas from* 10 *Initial Candle Power Gas.*

Total Observed Initial Candle Power.	Initial Candle Power Due to Benzol.	Initial Candle Power Not Due to Benzol.	Gallons Benzol to be Used Per 1,000 Cubic Feet.	Candle Feet Per Gallon.
10	10	0	.310	19,300
10	8	2	.230	26,000
10	6	4	.190	31,500
10	4	6	.160	37,500
10	2	8	.140	42,900

Various Possibilities for Producing 18*-Candle Power Gas from* 14 *Initial Candle Power Gas.*

Total Observed Initial Candle Power.	Initial Candle Power Due to Benzol.	Initial Candle Power Not Due to Benzol.	Gallons Benzol to be Used Per 1,000 Cubic Feet.	Candle Feet Per Gallon.
14	14	0	.300	13,300
14	12	2	.240	16,600
14	10	4	.165	24,200
14	8	6	.135	29,600
14	6	8	.120	33,300
14	4	10	.105	38,000

TABLE NO. 2.—*Showing Benzol Required in Gallons per 1,000 Cubic Feet of Gas to Raise Known Candle Powers Due to Oils (Benzol) to Given Finished Candle Power Due to Oils (Benzol).**

Finished Candle Power Produced Due to Benzol Only.	Initial Candle Power Due to Oils (Benzol)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
11.....	.25	.235	.215	.200	.175	.150	.120	.090	.060	.030	.000	....	....	....	....
12.....	.285	.275	.255	.235	.215	.190	.165	.130	.105	.070	.030	.000	....	....	....
13.....	.335	.320	.300	.280	.260	.235	.210	.175	.150	.115	.080	.040	.000	....	....
14.....	.385	.365	.350	.330	.310	.280	.260	.230	.200	.170	.130	.090	.050	.000	....
15.....	.45	.435	.420	.400	.375	.355	.330	.300	.270	.240	.200	.155	.100	.060	.000
16.....	.53	.510	.490	.475	.450	.430	.400	.375	.345	.315	.275	.240	.190	.140	.075
17.....	.605	.590	.570	.555	.530	.510	.480	.455	.425	.390	.360	.320	.275	.220	.155
18.....	.685	.670	.650	.630	.610	.590	.560	.530	.500	.465	.430	.395	.350	.300	.235
19. ...	.78	.765	.745	.725	.705	.680	.650	.625	.600	.560	.520	.475	.430	.380	.325
20.....	.88	.860	.835	.810	.790	.765	.740	.710	.690	.650	.610	.565	.520	.470	.420

* Table No. 2 is identical with Chart No. 2.

The above case of raising 14-candle power gas to 18-candle power may explain some of the widely different results which have been obtained in various works where benzol enrichment has been experimented with, even though no troubles were experienced with deposition of oils after enrichment. For instance, assume that a mixture of equal parts of coal gas and water gas of 14 and 22-candles, respectively, were yielding a finished gas of 18-candles, and it were desired to reduce the candle power of the water gas by substituting benzol enrichment. The measure of the success of the change would, of course, depend on the candles obtained per gallon of benzol. Assume that 14-candle power water gas is made instead of 22. Then the enrichment is to be 4-candles of benzol added to a half-and-half mixture of coal gas and water gas of 14-candle power. Upon the composition of the 14-candle power gas, as to the ratio of the candle power due to benzol to that due to true gases, would depend the enriching value of the benzol used. From the above table it is seen that this enriching value may vary from 13,000 to 38,000 candle feet per gallon. If the water gas is such that a large portion of the 14-candle power is due to its content of condensable oils, much lower results would be obtained than if a large portion of the 14-candle power is due to true gases (ethylene, etc.). The same is true of coal gas. It is, therefore, very apparent that the quality of the gas to be enriched is of quite as much importance as the quality of the benzol to be used. Aside from the carrying properties of the benzol, the proportions of the candle powers of the initial gas which are due to oils and to true gases are to be considered.

Considering the above figures of the possibilities of benzol enrichment of 14 candle power gas to 18-candle power gas, it is seen that there are opportunities for realizing very cheap enrichment. For instance, in the above case of a half-and-half mixture of coal gas and water gas, in which the water gas is so made that the mixture contains 8-candle power, due to oils, and 6 candles due to true gases (ethulene, etc.), it is possible to realize 29,000 candle feet per gallon of enriching benzol.

These conditions show that it is essential, in attempting to use benzol enrichment, to investigate very carefully the gas to be enriched, and that the process can be a success or a failure dependent on the quality of the gas regardless of the quality of the enriching benzol to be used. It is, therefore, not rational simply to reduce the oil used in water gas machines and substitute benzol enrichment, but very careful work should be done to make the water gas best suited to the conditions. In the enrichment of coal gas alone the same conditions are essential, namely, that, to secure the best results from benzol enrichment, those methods should be employed in retort and condensing house practice, by which the maximum ratio of the candle power due to true gases to that due to oils will be realized. Coming next to the carrying properties of benzol, Mr. Earnshaw's article is quoted:

"The commercial success of such enrichment will depend upon the difference in vapor tension. It is evident that an increase in quantity of vapor, and, therefore, an increase in candle power, can only be obtained by increasing the vapor tension of the hydrocarbons n the gas." (Provided the gas is saturated before enrichment). "If the tension of the enriching liquid is very high, the addition of a small amount may raise the tension of the combined vapors so that the gas will carry the amount of vapor necessary to give the desired increase in candle power. In this case the full enriching value of the added vapor is developed. If the vapor tension of the enriching liquid is but little higher than that of the vapor already present in the gas, then the desired enrichment can be obtained only at considerable cost and the full value of the enriching liquid cannot be utilized. Enough of the benzol must be added to bring the average vapor tension up to the required point, but as the total quantity of vapor will now be much greater than the gas can carry, the surplus will be condensed."

This is, undoubtedly, as definite a statement of the facts as can be made, and brings out the laws which must be recognized in order to use benzol enrichment successfully. From a recent study of commercial benzols usually marketed for gas enrichment purposes the vapor tensions are found to be sufficiently high so that the amounts that a gas can retain at reasonably low temperatures (36° to 40° F.) and pressures, up to, say, 20 or 30 inches head of water, are ample to give at least 16 to 18-candle power due to benzol only. This was tested out in actual practice and the gas at the end of a 2-mile transmission, under 20 to 30 inches water pressure, with a temperature of 35° to 37° F., was found to retain 16 to 17-candle power due to benzol only. This gas before enrichment and travel was saturated with an oil mixture of so low a tension that the addition of very high tension enriching benzol could not raise the average tension sufficiently to enable all the oils to be retained. The result was, as Mr. Earnshaw states, that the full value of the enriching oil was not realized because the surplus low tension oils were condensed. However, even under these conditions in which there was deposition of oils in transmission, 18,500-candle feet per gallon were realized throughout winter months under transmission conditions above mentioned. Temperature 33° to 37° F.; pressure 20 to 30 inches water. The gas was 10-candle power initial, enriched to 17.50. The initial gas carried 8 to 9.50 candles, due to benzol and, therefore, the enriched gas after transmission carried 15.50 to 17-candle power due to benzol only.

A study was also made of the condensates in the pipe lines. This examination confirmed the above statement which was based on examination of the oil mixture present in the gas before enrichment and the enriching benzol used. That is to say, the major portions of the condensates were low tension oils that had been present in the initial gas and not in the enriching benzols used. It is, therefore, apparent that, if the oils present in a gas to be enriched are of as high vapor tension as ordinary commercial benzols, 16 to 17-candle power due to benzol can be retained without loss under transmission conditions, as above outlined.

Along this same line it can be predicted that if gas of a higher illuminating power not due to condensable oils is to be enriched, sufficient benzol can be carried to produce 16 to 17-candle power, even if the oil present in the initial gas is of a little lower tension than that of ordinary commercial benzol. The above case, which describes the delivery of 16 to 17-candle power, due to benzol, shows some loss in transmission. The fact that this candle power due to benzol was delivered, indicates that, if there had been present in the gas before transmission only benzol of the same quality as that which reached the delivery end, no loss should have been expected.

To substantiate the statement that benzol equivalent to 16 to 17-candle power can be carried without loss under transmission conditions as outlined, the practice at Detroit is cited as an example. At this operation by removal from the gas to be enriched of only those oils of the very lowest tension, gas was delivered, in the severest winter weather, a distance of about 2½ miles, under a pressure of 24 to 60 inches of water, with practically no loss in candle power. This gas was of 18-candle power, of which 15.50 to 16 candles were due to benzol. The benzol used at Detroit was a so-called high grade oil, testing 95 per cent., distilling to 212° F. This benzol combined with that present in the initial gas produced an oil mixture of such a ten-

sion that 17.50 to 18-candle power due to oil was delivered without any loss.

Ordinary commercial benzol is an oil mixture varying in test from 80 to 90 per cent., distilling to 212° F. As the per cent. distilling to 212° F. increases, there is a rise in the vapor tension, but probably in no definite ratio to the distilling point, owing to the complex mixture of the oils. Therefore, the higher the grade of enriching benzol used, the higher will be the average vapor tension of the benzol mixture in the enriched gas and, consequently, the larger the benzol content that can be retained per unit of gas.

From the fact that, in commercial practice, a gas carrying oils of about the nature of ordinary commercial benzol was saturated at 33° F., when the oil content was equivalent to 15.50 to 17-candles, it is apparent that, if it is desired to increase the candle power due to benzol, the quality of the oil in the finished gas must be improved. That is to say, the vapor tension of the mixture must be higher. This is possible by using a higher grade of enriching oil or reducing the amount of low tension oils in the gas to be enriched, or by the use of excess enriching benzol and the consequent deposition of the low tension oils by substitution in transmission. These are conditions which must be worked out for the individual problem under consideration. It cannot be stated that benzol added to all gases will give certain definite results, but from the above experience, with gas having a high candle power due to benzol, it is certainly evident that, if the problem is properly worked out in accordance with the physical laws involved, benzol offers opportunities for most economic enrichment.

If it is desired to transmit the gas under high pressures it is essential to have present after enrichment only very high tension oils. For example, a saturated gas of 18-candle power, all due to benzol, at atmospheric pressure, carries .7 gallon of benzol per 1,000 cubic feet. If the pressure on this gas is increased to 15 pounds and the temperature reduced to the same point as before compression, the amount of oil carried will be reduced 50 per cent., and the candle power reduced to about 13, if no change took place in the oil mixtures (in practice this candle power would be higher than 13, due to the benzol being a mixture, and as the oil is precipitated out there is formed a mixture of somewhat higher tension than that of the original benzol present, so that considerably more than 50 per cent. is retained). In order to practice benzol onrichment before high pressure transmission, with minimum candle power losses, only the very highest tension oils should be present so that the gas is not saturated before compression. If it is necessary to use high pressures for the delivery of any gas containing condensable hydrocarbons, it is practically certain that the increased pressure will decrease the oil content and the candle power, if the gas even approaches saturation before compression.

An example of the gradual loss in candle power of a saturated gas, due to decrease in temperature, is well brought out in an article by Mr. W. H. Gartley, published in the "Proceedings" of the American Gas Institute, 1906, p. 603, plate No. 4. With a saturated gas at a constant temperature a similar loss must be sustained with increased pressure, for the oil content is in an inverse ratio to the absolute pressure, the same as it is in direct ratio to the temperature. With increased pressure there is, of course, a tendency to deposit, first, the oils of the lowest vapor tensions. Therefore, at the low pressure end of a high pressure transmission line the gas is considerably below saturation and contains almost entirely high tension oils and is in the ideal condition for benzol enrichment. For instance, to deliver very high candle power water gas under high pressure with no rise in temperature, there must be a loss in transmission similar to the loss by reduced temperature, and, in order to have the desired candle power at the delivery end, a certain higher candle power must be started with. If, now, instead of starting with the necessarily higher candle power gas than is to be delivered, the gas is enriched with benzol after high pressure transmission, the benzol can be retained to the best advantage. The low tension oils will have been deposited by the compression, and the gas is, therefore, in a condition in which it can retain the maximum benzol content. This again is simply an application of the physical laws on which the principal of benzol enrichment is based. The high pressure is an ideal means for removing the low tension oils which would otherwise limit the effectiveness of the benzol. When these low tension oils are eliminated there should be no difficulty in retaining ample quantities of ordinary commercial benzol for producing reasonable candle powers, which can be retained in low pressure transmission, even in extremely low temperature. Furthermore, if those low tension oils are precipitated out by compression after enrichment, they bring down with them some of the high tension oils as well, due to the fact that the separation or fractionating is not sharp in the gas mains, where the velocity is very high.

Enrichment with benzol at the delivery end of high pressure lines is simply a proper application of fundamental principles. By this plan benzol is added under the condition in which it will be retained according to physical laws and under the same condition that it has been found to be retained in actual practice. It is understood that the results at Chester, Pa., will be presented to illustrate the advantages of this practice.

At Milwaukee benzol is added to the gas after 1½ miles of transmission under about 2 pounds pressure, so that a small portion of the tension oils have been deposited before enrichment. The gas is then tested 2 miles beyond the point of enrichment. The following operation results may be of interest:

1909. Month.	Initial Candle Power at Ovens.	Gals. Enriching Benzol Used per M. Cubic Feet of Gas.	Fin. C. P. After Transmission.	Candle Feet per Gallon of Benzol.
February.....	9.14	.40	17.19	20,201
March.....	9.59	.39	17.40	19,876
April.....	10.02	.42	17.00	16,517
May.....	10.15	.40	17.42	17,915
Average.....	9.72	.40	17.25	18,627

Enriching values of the oil used there are determined from the candle power of the gas as it leaves the condensing house at the ovens, as compared with the candle power after transmission, and, therefore, absorb all the loss due to the deposition of the low tension oils. That is to say, the enriching value represents the enrichment of the gas, not as put into a holder at the works, but of the gas as delivered over 2 miles at a temperature of 35° to 40° F., and pressures up to 2 pounds per square inch. Mr. W. S. Blauvelt has presented the results at Detroit which show that, with gas better prepared for benzol enrichment, but still carrying a total benzol content about the same as Milwaukee, considerably higher enriching values can be realized and practically no loss sustained in transmission. It has been aimed in this report to show some of the applications of the physical laws covering the use of benzol as well as to bring out some studies showing the values of benzol that is retained.

A fair consideration of the possibilities of benzol, with due consideration of the conditions which affect the retention of this enriching medium, bring out very clearly Mr. Earnshaw's conclusion "that every case in which it is desired to use commercial benzol as an enricher must be treated as an independent and separate problem and considered in the light of known laws."

It is evident that practically no two operations need the same treatment in order to give the most economical results. In one case a small loss in transmission might be more economical than the cost of the removal of the low tension oils at the works, whereas in another case exactly the opposite might be true. Similarly the cost of obtaining the desired results must be balanced one against the other in any case, but the results which have been obtained surely indicate that, if properly handled, there are opportunities in many cases for remarkably economical enrichment by the use of benzol.

Benzol Enrichment at Detroit.—1. The Solvay Process Company, at its Detroit works, operates retort ovens primarily for the production of metallurgical coke. The coal used yields a gas of comparatively low illuminating power, the richest gas seldom exceeding 12-candle power. Almost all of the illluminating power is due to condensable hydrocarbons; by washing the rich gas with an absorbing oil its illuminating power is reduced below 2 candles.

2. The surplus gas, enriched with benzol, is sold to the Detroit City Gas Company. The amount of enrichment is varied from time to time at the request of the gas company, who may ask for from 15 to 20-candle power, and may change their requirement as frequently as they choose.

3. At the coke oven plant the gas is condensed, scrubbed and enriched with benzol; it is then delivered through a 16-inch main, about 2,300 feet long, under a pressure varying from 13 to 19 inches of water to the purifying plant of the gas company at Delray Station.

4. After purification, the gas is pumped, under a pressure varying from 24 to 60 inches, to Station A, a distance of about 2½ miles. For the greater part of the distance the main is laid very near the surface, so that the temperature of the gas varies greatly with the weather; in midwinter often going as low as 25° F.

5. Gas sample holders are installed at the coke oven plant, Delray station and Station A; in these holders gas samples, representing 12-hour runs, are collected. At the ovens are obtained samples of the

gas before enrichment. The official candle power is determined at Station A, where photometric observations are made by representatives of both companies. The observations made at Delray station provide a check to determine candle power losses in the main between there and Station A.

6. The candle power of the 12-hour holder samples does not always check very closely with the average of 12 hourly candle power determinations made direct from the line, as the holder sample is seriously affected by the previous samples. For a period of 2 weeks or longer, however, the average of a large number of line sample checks very closely with the average of the holder samples.

7. Hourly candle power determinations are made at the Delray station, and the results are telephoned immediately to the foreman at the ovens, who varies the quantity of benzol used in order to meet the candle power requirements of the gas company.

8. Before last winter great difficulty was experienced during the severest winter weather in enriching gas to 18 or 20-candle power at Delray station, and delivering the same candle power at Station A; when the atmospheric temperature fell there was frequently a loss of as much as 4 candles; when the weather grew warmer the candle power at Station A would often be 2 candles higher than at Delray.

9. Obviously this irregularity was due to the presence in the gas, after enrichment, of certain hydrocarbon vapors having such low vapor tension that they would condense when cooled to the low temperatures to which the gas was subjected at times, and the resulting condensate would evaporate when the temperature of the gas rose. In view of the fact that of the total illuminating power, of say 18 candles, at least 16½ candles are due to condensable hydrocarbons, and only about 1½-candle power to permanent gases, these results were not at all surprising. It was evident that complete success could be obtained only by the elimination frem the gas of all hydrocarbons which would condense under the most severe conditions of temperature and pressure to which the gas would be subjected.

10. To overcome the difficulty, the first step was to install an apparatus in which the gas to be enriched is washed with absorbing oil containing from 3 to 5 per cent. of benzol. This absorbing oil takes from the gas only the low vapor tension hydrocarbons. A recent test of this oil washer gave the following results:

	Before Oil Washer.	After Oil Washer.
Grams napthaline per M. cu. ft. gas	17.32	3.55
Gals. unfractionated, naphthaline free, condensable oil, carried as vapor per 1,000 cu. ft. gas.	.268	.251
Fraction of above oil distilled up to 212° F. Gals. per 1,000 cu. ft. gas	.171	.177
Fraction of same distilled above 212° F. Gals. per 1,000 cu. ft. gas	.097	.074
Average candle power, 18 tests	8.25	8.11

From this test it will be noted that 1,000 cubic feet of gas in passing through the washer took up from the washing oil .006 of a gallon of benzol, and gave up to the oil 13.77 grams of naphthaline and .023 of a gallon of other low vapor tension hydrocarbons. There is no doubt that, by increasing the capacity of the oil washer, a still further reduction in the quantity of low vapor tension hydrocarbons carried by the gas can be made, thus increasing the vapor tension of the hydrocarbon vapors left in the gas and also the capacity of the gas for carrying additional quantities of high grade benzol.

11. The gas having been prepared for enrichment as outlined above, the next step was to make a high grade benzol practically free from low vapor-tension oils. This was accomplished by very careful fractionation. The standard adopted for winter use was a benzol, 95 per cent. of which distills at 212° F. This grade of benzol freezes at about 32° F.; for winter use, therefore, it must be stored where it can be kept above that temperature.

12. The results after these two changes were fairly satisfactory. Tests in the coldest weather, however, showed that there still remained in the gas enough of the low vapor tension hpdrocarbons to cause an appreciable loss of illuminating power, when the gas was enriched to above 18-candle power and afterward cooled to below 32° F. In the following table are given the results of a number of candle power determinations made direct from the line at Delray and and Station A.

TABLE II.—*Gas Enrichment—February*, 1909.

Date.	Mean Atmos. Tem. °F.	Initial C.P.	Required C.P.	Average C.P. Line, Delray.	Holder C.P. Line, Delray.	Official C.P. Holder, Sta. A.
1	22	7.91	18.00	18.77	19.06	18.52
2	30	8.16	18.00	18.51	19.18	18.24
3	30	7.31	18.00	18.58	17.80	17.68
4	41	7.55	18.00	18.31	17.30	17.00
5	42	7.43	18.00	18.31	16.93	16.94
6	35	7.06	18.00	18.25	17 13	16.76
7	33	8.47	18.00	18.72	18.73	18.68
8	24	7.94	18.00	18.14	17.32	17.00
9	30	6.79	18.00	17.57	16 37	16.74
10	18	7.45	18.00	17.19	16.74	16.50
11	26	8.94	18.00	19.09	18.13	19.27
12	38	8.08	18.00	18.64	18 57	18.39
13	27	7.22	18.00	18.03	17.51	17.03
14	23	6.65	18.00	18.00	17.13	17.25
15	21	6.72	18.00	18.21	17.68	17.34
16	16	6.99	18.00	18.27	18.48	18.17
17	21	7.02	18.00	18.72	18.82	18.42
18	37	7.07	18.00	18.79	19.17	18.93
19	37	7.07	18.00	18.42	18.22	17.62
20	33	6.73	18.00	18.30	18.38	18.10
21	34	7.30	18.00	17.96	17.75	17.90
22	37	7.28	18.00	18.22	18.37	17.37
23	42	7.31	18.00	18.37	18.12	17.99
24	28	7.03	18.00	18.32	18.62	17.30
25	22	6.90	18.58	18.94	19.00	18.52
26	36	8.44	19.00	19.96	19.27	19.88
27	27	8.79	19.00	18.87	18.82	19.08
28	24	9.82	19.00	19.69	19.42	19.20
Aver.	29.8	7.55	18.13	18.47	18.14	17.92

Gallons benzol used per 1,000 cubic feet of enriched gas, .453.
Candles rise due to benzol added, 10.37.
Candle-feet enrichment per gallon benzol, 22,892.

TABLE III.—*Gas Enrichment—March*, 1909.

Date.	Mean Atmos. Tem. °F.	Initial C.P.	Required C.P.	Average C.P. Line, Delray.	Holder C P. Line, Delray.	Official C.P. Holder. Sta. A.
1	35	9.64	18.17	18.80	18.87	19.05
2	36	9.70	18.00	18.75	18.91	18.66
3	28	9.88	18.00	18.94	18.37	17.07
4	26	9.90	18.00	18.85	18.72	17.87
5	29	9.06	18.00	19.18	19.27	18.94
6	38	9.27	18.00	19.08	18.50	18.48
7	36	9.09	18.00	18.98	18.51	19.16
8	34	8.79	18.00	18.59	18.63	17.15
9	37	7.24	18.00	18.73	18 22	18.48
10	30	7.22	18.00	18.77	18.20	17.81
11	29	8.88	18.04	18.63	18.59	18.77
12	33	8.64	18.50	19.16	19.24	19.05
13	35	8.90	17.38	18.36	17.55	19.22
14	31	9.08	17.00	18.00	17.83	18.18
15	32	8.90	18.00	18.26	18.00	17.77
16	24	9.79	17.94	18.50	18.05	17.65
17	23	9.50	19.17	18.87	18.68	18.10
18	33	11.05	20.00	20.76	20.12	19.52
19	37	9.11	18.02	18.67	18.63	19.34
20	30	9.65	18.37	18.58	18.74	19.52
21	29	9.83	19.31	19.39	19.42	19.46
22	32	10.17	19.75	19.63	19.42	19.50
23	37	9.92	18.54	18.71	19.13	19.60
24	37	9.46	16.42	17.10	17.70	18.40
25	29	9.67	16.71	17.40	17.90	17.94
26	38	9.97	16 79	17.33	16.97	17.77
27	36	8.88	15.04	15.61	16.48	16.52
28	37	9.00	15.50	16.04	15.91	16.29
29	35	8.48	15.00	15.60	15.22	15.91
30	36	8.48	16.50	16.89	16.94	16.97
31	39	9.30	17.67	17.47	17.74	17.27
Aver.	33	9.24	17.73	18.31	18.21	18.24

Gallons benzol used per 1,000 cubic feet enriched gas, .372.

TABLE I.—*Tests to Determine Loss of Candle Power by Gas after Enrichment.*

Date 1909		Shift	Average atmos. temp.	In'l C. P.	Delray Station: No. of Tests	Delray Station: Avge. C. P.	Candles Enriched	Station A.: No. of Tests	Station A.: Avge. C. P.	Loss of C. P.	Gain of C. P.
January	8	Day	26.0° F	8.10	11	17.12	9.02	8	17.22	....	.10
	8	Night	28.5°	7.60	12	17.34	9.74	8	18.31	....	.97
	14	Day	35.0°	7.39	7	18.72	11.33	7	18.36	.36	....
	14	Night	32.0°	8.70	9	18.77	10.07	9	18.34	.43	....
	15	Day	27.0°	7.69	7	18 13	10.44	7	16.42	1.71	....
	15	Night	17.0°	8.12	9	18.57	10.45	9	17.01	1.56	....
	19	Day	34.0°	9.43	7	18.11	18.68	7	18.81	....	.70
	19	Night	28.0°	9.27	9	18.73	9.46	9	19.86	....	1.13
	20	Day	33.0°	9.28	8	18.80	9.52	8	18.33	.47	....
	20	Night	35.0°	8.58	9	18.83	10.25	9	19.49	....	.66
February	1	Day	22.0°	6.97	5	18.77	11.80	5	18.93	....	.18
	1	Night	22.0°	8.85	9	18.99	10.14	9	20.93	....	1.94
	2	Day	33.0°	8.23	7	18.16	9.93	7	19.43	....	1.27
	2	Night	28.0°	8.10	9	18.73	10.63	9	20.06	....	1.33
	3	Day	29.0°	7.27	7	18.11	10.84	7	17.86	.25	....
	3	Night	31.0°	7.35	9	18.75	11.40	9	18.93	....	.18

Candles rise due to benzol added, 9.
Candle feet enrichment per gallon benzol, 24,194.

It will be noted that the only heavy loss of illuminating power occurred on January 15, when the atmospheric temperature fell from 32° F. to 17° F.

13. Tables II. and III. give fairly complete records of the gas enrichment operation during February and March. The candle power of the gas before enrichment was higher in March than in February, due to slight changes in the oven operation.

14. Average analyses of the enriched gas, and the average calorific power, are given in Table IV. For each month 16 analyses are averaged. Calorimetric determinations were made hourly and the results given in the table are the averages of all these hourly tests.

TABLE IV.—*Gas Analyses.*

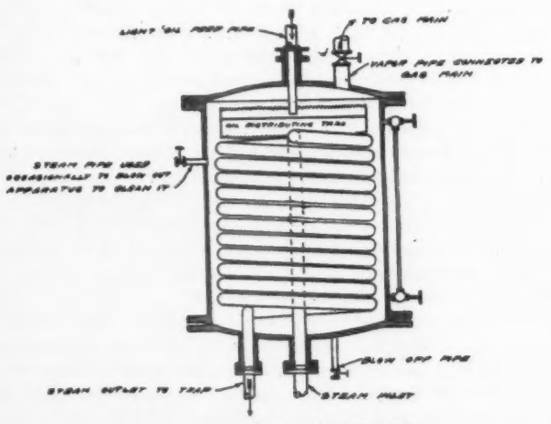
	C_6H_6	CO_2	C_2H_4	O_2	CO	H_2	CH_4	N_2	B.T.U.*
February....	1.8	1.4	3.3	0.3	4.7	48.3	35.7	4.5	659
March	1.7	1.4	3.3	0.4	4.7	48.8	36.2	3.5	657

*Junker's Calorimeter.

15. Apparently the enriching value of the benzol used decreases as the total benzol carried by the gas increases. Considering the facts that the total benzol carried by the gas in these 2 months average about $\frac{6}{10}$ of a gallon per 1,000 cubic feet of enriched gas, that from 14 to 17-candle power was derived from this source, and that the maximum loss of candle power under the severest winter conditions was less than 2 candles, the enriching value of the benzol used was as high as could reasonably have been expected. With an ordinary coal gas, of say 15 candle power, of which say 8 candles are due to permanent gases and only 7 candles to condensable hydrocarbons, higher enriching values should be obtained. Such a gas, if enriched to 18-candle power, would carry but 10 candles due to benzol, instead of 15, as in the case of the Detroit coke oven gas; and, under such conditions, lower vapor tension hydrocarbons could be carried without danger of loss of candle power due to condensation.

16. The apparatus employed to vaporize benzol is shown in the sketch, Fig. 1. To reduce radiation loss the entire apparatus is cov-

FIGURE 1


LIGHT OIL FEED PIPE
TO GAS MAIN
VAPOR PIPE CONNECTED TO GAS MAIN
OIL DISTRIBUTING TRAY
STEAM PIPE USED OCCASIONALLY TO BLOW OUT APPARATUS TO CLEAN IT
BLOW OFF PIPE
STEAM INLET TO TRAP
STEAM INLET

BENZOL VAPORIZER.

Fig. 1.

ered with magnesia. This vaporizer has a capacity of 100 gallons of benzol per hour when using steam at 25 pounds pressure in the heating coil. The capacity per square foot of heating surface is approximately 4 gallons of benzol per hour. In operating the vaporizer, about 2 gallons of tarry oil are drawn off the bottom for every 400 gallons of benzol vaporized. After vaporizing about 60,000 gallons, it is generally necessary to remove the coil and clean off the carbonaceous matter accumulated thereon. In order to avoid interruptions to the opening, a square vaporizer is provided.

Use of Benzol for Enriching Water Gas.—The following figures were supplied by Mr. S. R. Walker, Superintendent of the Orange County Lighting Company, Middletown, N. Y. They give the comparative results of operation during two winters (1907 and 1908) on carburetted water gas, and 1908 and 1909, when benzol was used to enrich the carburetted water gas.

	1907-1908		1908-1909		
Month.	Oil. per 1,000.	C. P.	Oil. per 1,000.	Benzol per 1,000.	C. P.
December.....	5.0	21.1	4.02	.096	21.5
January.....	4.8	21.4	4.16	.110	21.8
February	5.1	20.9	4.18	.110	22.0
March.....	4.8	21.2	4.03	.124	21.0
Totals.....	19.7	84.6	16.39	.440	86.3
Averages ...	4.9	21.1	4.10	.110	21.6

(Signed) V. F. DEWEY.
WARREN S. BLAUVELT.

Since the foregoing report was completed, the following tests have been made on the oil washer:

	Date June 3, 1909.	Date June 9, 1909.
Gals. absorbing oil fed to washer per 1,000 cubic feet gas	1.25	2.54
Per cent. benzol in oil feed	4	...
Temperature of gas entering washer	75° F.	73° F.

	June 3, 1909. Before Washer.	June 3, 1909. After Washer.	June 9, 1909. Before Washer.	June 9, 1909. After Washer.
Grams naphthaline per 1,000 cubic feet of gas	23.41	6.61	30.34	19.73
Gals. unfractionated, naphthaline-free oil carried as vapor, per 1,000 cubic feet gas	.244	.239	.203	.172
Fraction of above oil distilled up to 212° F. gals. per 1,000 cubic feet gas	.158	.188	.139	.135
Fraction of above distilled above 212° F. gals. per 1,000 cubic feet gas	.086	.051	.064	.037
Candle power of gas, average	8.67	8.51	6.32	6.21
Candle power of debenzolized gas; *i. e.*, gas from which all illuminants soluble in oil have been removed	....	....	....	.45

In the course of the test of June 9, a portion of the gas was passed through a series of vessels containing an absorbing oil. The candle power of the resulting debenzolized gas varied from .36 to .64, the average being .45. WARREN S. BLAUVELT.

(To be Continued.)

[CONTINUED FROM VOL. XCI., PAGE 1395.]

PROCEEDINGS, SEVENTEENTH ANNUAL CONVENTION OF THE PACIFIC COAST GAS ASSOCIATION.

HELD IN SAN FRANCISCO, CAL., SEPT. 21, 22 AND 23.

SECOND DAY—AFTERNOON SESSION.

Discussion on the Grover Paper.

Mr. Douglas—I would like to ask the members who have had experience in high pressure distribution whether they have any trouble with water in the regulators. We have trouble with water in the regulator where the services are at the least depth. We have two services, which are about 1½ feet below the main, and in them we have no water at all.

Mr. Strange—We have had some experience in that line, using high pressure efficiency from 6 to 12 pounds at different times in the day. At one time we had considerable trouble and found it absolutely necessary to keep the mains perfectly dry from liquid, otherwise the mains are affected. We installed for a distance of about 1 mile from the works 4 large drips at various distances, each of which holds possibly 12 gallons, and these are pumped every morning. We take out about .04 of a gallon of liquid per 1,000 of gas every day. Since the installation of the drips we have had no trouble.

Mr. Martin—In that connection, if your compression were high enough, you would concentrate all the vapors at your works, and in that way your mains would be dry; but if you are compressing very lightly, the shock is not sufficient to liquify the vapors in the gas and moisture will accumulate. I believe that 250 to 300 pounds would be productive of the best results. The cost of compression would be greater, but you eliminate the expense of purification. You have a by-product of value in the lampblack, and any additional fuel would not add very much to the cost of the gas. It would very largely eliminate an expensive problem, and also the dissatisfaction of your customer.

Mr. Kuster—A particular thing I have noticed in a high pressure system at Fresno, is this: We have only about 30 pounds compression there, and we are troubled by water in the services. We would have probably a repetition of that, and that particular service would require cleaning every 2 or 3 days until the consumer would come to tell me either to give him constant service or cut out the meter. In two or three cases I told them that if they would just have a little patience the thing would naturally drive over onto some other fellow's corner pretty soon. He laughed at me over it. It is a fact, nevertheless. In the particular case I have in mind a contractor, who is now one of the City Council, came to me with a complaint, and I worried along with him for probably a month, or until I saw I couldn't stand him off any longer, so I told him we would put in an ordinary 30-gallon boiler, that we ordinarily connect up on a circulating water medium. After that was installed we never had a bit more trouble. That drip was examined every week for several weeks, and we never could find out where the water went to that had troubled him all the time.

Mr. Morgan—Our high pressure services are very limited. Numbering about 75. They are all in Parkside, a district probably 6 or 7 miles from the station, so that long before the gas gets over there the moisture has already been precipitated. The drips in that line are very seldom pumped, but when we do examine them we usually find them dry. In low pressure services we occasionally have water, but only when the service is trapped.

Mr. Clarke—We have a 15-mile, high pressure line, with 250 customers on its end; we don't have any water or naphthaline at that end.

Mr. Kuster—Do you have it at the works?

Mr. Clarke—No, I don't have any naphthaline troubles at all.

The Chairman—Have you had trouble in that way, Mr. Lowe?

Mr. Lowe—If I had I have forgotten it. Our practice is to compress the gas in tanks for our storage purposes. I am doing away with gasholders very largely, using as small a holder as possible, and storing in tanks, discharging the gas through a so-called tank regulator into the mains at a lower pressure, say 4 or 5 pounds, or whatever is requisite to deliver the amount of gas needed, and we don't have any trouble. I have heard that in some locations this is not so, but I am satisfied, if you will compress your gas to about 30 pounds pressure, you will overcome your naphthaline and water vapor troubles. If you will go as high as 80 or 90 pounds, you will practically eliminate the sulphur trouble. At our last meeting I told you of a little installation at Watsonville which was designed especially for the purpose of overcoming trouble of this sort. The gas is compressed to about 75 or 80 pounds pressure in a tank, from which it escapes into an up-town holder, where it is stored and from where it passes into the low pressure system. The gas is dried by compression, and, notwithstanding the fact it has an opportunity to saturate itself with water vapor in the up-town holder, it does not seem to do so, or at any rate not to an extent to cause any trouble. We had a number of trapped services and depressions in the mains, which gave considerable trouble, but since the installation of the drying plant the troubles have disappeared, and we are able to supply the customers without annoyance to them. In Palo Alto, wherein we have about 16 miles of pipe, supplying about 1,200 consumers, we have no trouble. A like condition exists at Tonopah, where all the gas is compressed and stored at 75 to 80 pounds pressure. As I said before, if we have had naphthaline or drip trouble, I have forgotten them and I now go to sleep without worrying. I am a very firm believer in the high compression of gas, and while it costs a couple of cents per 1,000 to do it, one sure thing is that it overcomes troubles and complaints which you can't take care of for 2 cents per 1,000.

Mr. Cline—We look upon high pressure as a facility for delivering gas at long distances, and if it is going to cure all the other evils it is something to reckon with, particularly if it is to be the means of the destruction of naphthaline vapors in the gas.

Mr. Lowe—If I were installing a new gas works in a city of a million or more people, I wonld compress every article of gas to 75 or 80 pounds, if for purposes of cleansing and purification only.

Mr. Strange—I would like to ask Mr. Lowe—he says they don't pump any drips—if they had any condensation from their compressors at 75 pounds?

Mr. Lowe—Yes, it is retained in the storage tanks?

Mr. Strange—But you must drain those tanks to get rid of it at times?

Mr. Lowe—Very seldom. If a tank be filling we may draw off a little at times. We get very little water and soon reach a peculiar substance, which is undoubtedly a compound consisting of water vapor and various hydrocarbon vapors, which you recognize immediately—a sort of yellowish liquid—which you should allow to remain in your tank.

Mr. Strange—In time you must have an enormous amount on hand.

Mr. Lowe—No; the gas seems to take it up. It is water vapor in the gas that causes trouble, and if you extract that the naphthaline vapor will flow without much condensation. Illustrative of the virtures of dry gas, the following will be of interest: I have recently come into possession of the plant at Gilroy, which was operated for a number of years by the municipality, and, as you would naturally expect, was in a horrible condition. There are about 6 miles of main, and they were so completely filled with tar and muck that it was almost impossible to get any gas through them. We were compelled to open the mains at many points and clean them out with a sewer scraper. The improvements to the plant included a compressing system, and within 2 weeks after turning out dry, clean gas, our consumption doubled. That does not mean very much, as they were only sending out about 10,000 cubic feet daily when we took the works, but it is gratifying to know that within 2 weeks time, and with the same number of consumers, the consumption jumped from 10,000 to 20,000 a day, simply because we could give satisfactory service. High pressure gas has been the salvation of that situation.

Mr. Kuster—An interesting feature of the gas at Fresno that I would like to have explained is this: While I am not at Fresno, I am still interested in it, and that question has always bothered me. About ¼ of the gas manufactured there is pumped through the high pressure system, and the other part goes right off from the regular holder pressure, which is now 7 inches, though there are district governors that feed into that system. We seldom have any naphthaline troubles on our low pressure; 25 a week would probably cover all of them, and they are generally something of very trivial importance. Very little trouble clears them out, but for a distance of several hundred feet, on either side of the works (our high pressure loop goes entirely around the town), our mains constantly clog up with naphthaline or this yellowish water deposit Mr. Lowe referred to. Our pressure there is about 35 pounds during the peak load until during the time of lesser consumption, when we get down to 5, 8 or 10 pounds.

Mr. Martin—Do you pump any higher than that?

Mr. Kuster—No; that is our limit.

Mr. Martin—Do you pump directly into the main?

Mr. Kuster—No. We used to, but about 18 months ago 5 compression tanks were put in there and we pumped into them.

Mr. Lowe—How are the connections of your tank?

Mr. Kuster—We had a governor which would let the gas out at about 28 pounds pressure, but it was not enough on the peak. We regulated that by by-passing the governor and regulated our pressure on the high pressure system by the control of the mains, which would be practically pumping directly around in a loop.

Mr. Lowe—Have you had no other place wherein to collect the yellowish liquid? Your mains were acting as your storage tank?

Mr. Kuster—They were; but they were passing through the system. They were all hooked up together.

Mr. Lowe—My practice is, where I can, to use a tank 6 feet in diameter and about 30 feet long, the gas entering the tanks at one end and discharging at the opposite end, so that the gas passes over the full 30 feet of the tank before it escapes, no gas being allowed to escape into the mains, unless it does go through the tank.

Mr. Kuster—After watching this for some few months, I decided to make that experiment, and we did exactly the thing you said. We took off then large quantities of water and "goo" every morning, and our troubles were greatly reduced; but, even so, after that we continued to have troubles occasionally. The mains would have to be washed out with hot water, which I have done there repeatedly.

Mr. Bell—Where does Mr. Lowe compress that gas? Is it released into the holder?

Mr. Lowe—Watsonville furnished the only instance in which gas was so handled. At one time two plants were in operation at Watsonville, both of which finally came under our ownership. In laying the mains of one of the plants sufficient care had not been taken in arranging for drips. The mains were laid very shallow, and the services pitched toward the houses, consequently they were trapped at that point and caused much trouble. It was a question as to whether we should not be compelled to rip out those mains and services at great expense, but I thought we might overcome the trouble by compressing and drying the gas, hence we put in the system, with the result that we now have practically no trouble.

Mr. Bell—Does it take up any amount of water at the holder?

Mr. Lowe—I don't think it has time to do it.

Mr. Bell—I had something similar. I was wondering if I derived any benefit by covering my water tank with a heavy grade of oil, putting on 5 or 6 inches of oil.

Mr. Lowe—That was the intention at Watsonville, but before we got to putting the oil in we found our troubles were disappearing, and we never did put it in.

Mr. Bell—Our tanks carry about 300,000 a day, which we put out through that tank, and I was wondering whether it would not be a good idea to cover that with oil to eliminate the picking up of the water.

Mr. Lowe—That was my intention originally, but I found it was unnecessary in this instance.

Mr. Bell—Unneccessary in that small case?

Mr. Lowe—Yes. It might be in a larger one.

Mr. Bell—You would not advocate releasing the gas over that water and using it?

Mr. Lowe—I would, if it did not remain there too long. If it were passing out of the holder about as fast as you were sending it in, I wouldn't hesitate about doing it at all, and I certainly would try it before putting the oil on, because occasionally a holder will "blow," and you know what would then become of the oil.

Mr. Strange—We had at one time, and for very good reasons, to construct a purifier between the storage holder and the town, and we have always kept very careful count of the gallons per 1,000 of liquids deposited. We found we did have a deposit of over .06 to the gallon of liquid per 1,000 cubic feet of gas, compressed on an average to 10 pounds. After it was purified, it immediately dropped to .04, showing the purifier had dried the gas considerably.

Mr. Cline—What type of purifier was it?

Mr. Strange—A very hastily constructed wooden purifier, containing 3 feet of oxide.

Mr. Cline—High pressure?

Mr. Strange—No, low pressure.

Mr. Werrey—I am glad to hear this discussion going on, because I have nothing but high pressure in my company. And after hearing so many complaints from so many causes I will tell you my trouble. I have had none at all. The pressure is 85 to 90 pounds, very often the latter. We transmit to Grass Valley and Nevada City. I have opened the drips there many times and never found anything in a single drip at Nevada City, the far end. Of course, we get a little distillate in the compression tank, which we draw off occasionally; but as far as any liquid or naphthaline troubles are concerned, we have had none up there to speak of. I have not found a single instance of it in Nevada City yet. They have to climb a good many hills to get there, and maybe they have not strength to get out, but we have had no trouble. If anything else comes up I think we can find out a remedy for it after all that has been said here. I like to hear Mr. Lowe talk on these things, because he is a man who knows, while I am a man who doesn't know.

Mr. Jones—I want to give the members of the Pacific Coast Gas Association a conundrum to answer: Why doesn't Mr. Werry have troubles in Grass Valley and Nevada City? Nobody seems to answer it. It is because of Mr. Werry. And when you know him as well as I do, you will understand the reasons therefor.

Mr. Newbert—There comes under my supervision some 60 miles of high pressure mains, the pressure being about 60 pounds. As I understand you to say, you have had trouble with naphthaline stoppages at the beginning of your line. In our 3 years' experience we have not had a case of trouble traceable to naphthaline; in fact, we have had absolutely no evidence of it. A great deal of our distribution is reduced through regulators to 10 or 15 pounds for distributing purposes. We have had no trouble in the lower pressure.

Mr. Weber—I represent another town where high pressure distribution rules. We distribute our gas at 10 pounds by governors. We receive our pressure anywhere from 45 to 50 pounds in the compression tanks, through almost 17 miles of high pressure lines. We have been operating for 7 years, and have not had a single stoppage or interruption on account of naphthaline. We never discovered a drop of water in our distribution system, so I think high pressure does away with all trouble.

Mr. Hill—We are operating two gas plants, both on low pressure. I have been with the company for over 6 years, and will say that our men don't know what naphthaline means. We have never had a naphthaline trouble of any kind whatever, never had a service stopped up much less a main, and I doubt if you can find any naphthaline anywhere in either of our properties. Further, we are using Mr. Lowe's apparatus in all of our properties.

The Chairman—If the discussion is at an end we will now hear Editor Valentine recount his chapter on

EXPERIENCES.

Mr. President and Fellow Members: Having arranged the following experiences, in the order given, I set about the incubation of an idea for the introduction. An introduction has ever been prefixed to the report of this department, and its advent into the halls of the convention in a headless condition would be so contrary to ancient custom as to be almost a profanation. As I said, I did some thinking on the subject of the introduction, but the sorest mental travail served only to produce ideas that I found to have been used by my predecessors. I am strongly opposed to anything savoring of plagiarism; furthermore, at the present writing my thought-well is pumped dry; on the one hand I risk the profanation of an ancient custom, on the other I am impotent. There is but one choice under the circumstances—I must commit the profane act, and trust to the gods.

Experience in Handling Carbon for Water Gas Fuel.—Several years ago the question of fuel for our water gas sets was quite a problem to us. The carbon was damp, making too much steam; the fuel was hard to handle, and we had a tremendous amount of hauling to do. In studying this problem we hit upon a scheme which not only made the fuel easier to handle, pressed out the moisture to a certain extent, and was more economical of operation, but greatly reduced the cost of hauling. We took an ordinary brick press, of plunger pattern, and placed it on the ground near the water gas sets, removing the brick dies from the press and arranging the machine so as to mold one continual brick without cutting into regular lengths. We then placed an iron trough from the plunger die to the water gas platform, and at every plunge of the die a cubical piece of carbon was formed and pushed up the trough to the platform. The length of this was only broken by falling over the end of the trough. The only hauling we had to do, then, was from the pits to the apparatus. Our results from this machine were very satisfactory, and we are much pleased with it. This could be devised so as to have three, or even four, continual streams of carbon from this brick press; but, for our water gas capacity, one seems to be plenty. This product also makes an excellent boiler fuel, and as we use no smoke-making ingredients for a binder, there is very little smoke caused by its use.

A Captive Balloon as a Steady Consumer.—Not long ago, in our district, some parties applied for gas to be used in filling a balloon which they intended running as a captive. We advised them to secure a location near one of our high pressure mains, which they did, and we made a special tap for them. After the first filling of the balloon with gas, it was found that it lost a certain amount of gas each trip, and that it was necessary to replenish the gas a little every day, if many trips were made. The balloon was a spherical one, having a capacity of 56,000 cubic feet, and was allowed to ascend about 1,000 feet in the air and return by means of a hoisting engine and snatch-block attached to an anchor. The parties worked up quite a business, and as we had been sending a man each time they needed gas to turn on the valve, one of our foremen finally installed a regulator and meter, with quite satisfactory results. It consisted of a 2-inch Chaplin Fulton regulator, and a 100-light, round meter. The gas pressure on the inlet side of the regulator was 20 pounds, and the pressure on the outlet side varied between 7-inch and 16-inch water column, depending on the amount of gas being taken. The maximum amount of gas passed through the meter per hour at any time was found to be 3,600 cubic feet. This is beyond the rated capacity of the meter, but it was tested afterwards at this same rate and found correct.

How the Gas Company was Foiled.—The life of every gas man is interrupted by frequent experiences of a novel, interesting and often exasperating character. Here is one that can be identified under any of those terms:

I was connected with a plant which distributed gas under high pressure, and had for a customer a dentist whose persistent crankiness caused us a great deal of trouble. Besides worrying us with any number of ill-founded complaints, he was forever insisting that our service was poor, that we were rogues, and, in fact, that he knew more about the gas business than we did, anyhow. His complaints usually had to do with insufficient pressure, and examinations by our men never sufficed to prove to him that he was getting just as good service as any of our customers. We had frequently tested his governor, his meter, the service and the house pipes, and all were known to be in first-class condition. Nevertheless, our friend finally went so far as to appeal to the Board of Trustees and demand that an ordinance be passed compelling the gas company to furnish gas at 5 pounds pressure at the meter. This absurd demand was, of course, refused, but the complainant had recourse to subterfuge, as we shall see.

Some time after the episode with the Board of Trustees, we were notified by an insurance inspector of a leak at the man's meter, and on investigating found that the gas was passing through the meter at an exceedingly high pressure. This, of course, indicated that the governor was out of order, and an examination disclosed the fact

that the lid of the instrument had been removed, and a stiff spiral spring placed upon the diaphragm in such a way that, when the lid was replaced, it would bear down upon the spring, holding the valve open and permitting of a pressure of 5 pounds in the house pipes. We immediately removed both governor and meter, and a protest on the part of the outraged consumer resulted in our bringing the insurance company into the broil, with the outcome that every employee of the company was ordered forever to remain off the premises under pain of being shot.

(To be Continued.)

Interesting Legal Opinions
RESPECTING GAS PRACTICE.

Important Decision in the Case of Hommer (Administrator) v. The Haverhill (Mass.) Gas Light Co.—This relates to an action of tort to recover for fatal injuries to plaintiff's intestate, who died as the result of inhaling illuminating gas in a house where she was a domestic. In the lower (Superior) Court (before De Courcey, J.) there was a verdict of $5,000 for plaintiff, and defendant excepted. The case was heard before Brale, J., in the higher court, which resulted in an opinion nullifying the judgment. The Company was represented by Mr. W. J. McDonald and Messrs. Sweeney & Cox. Judge Brale's findings are appended:

"It may be assumed the jury could have found that the defendant's servants who were charged with the duty of making the changes, either knew or should know of the very serious consequences which might follow, if after disconnecting the large gas main at the upper bridge, they failed to shut off completely the supply of gas coming through the smaller main at the lower bridge. Thompson v. Cambridge Gas Light Company, 201 Mass., 77, 80. In view of this peril to the health, or lives of those whose houses were supplied by these mains, the act of one of the servants, who could have been found to have left the small main open after he had been ordered by the foreman to close it, would have warranted a finding of gross negligence within the meaning of Rev. Laws, c. 171, s. 2, under which the action is brought. Oughlihan v. Butler, 189 Mass., 289; Mullins v. N. Y., N. H. & H. R. R. Co., 201 Mass., 38, McNamara v. Boston & Maine R. R. Co., 202 Mass., 492. But if the tenth request accordingly was properly refused, and the exceptions to the refusal to give the nineteenth request not having been argued must be treated as waived, the first and fourth requests should have been given. By the provisions of the statute, before any recovery could be had, the burden of proof was on the plaintiff to introduce some affirmative evidence, that her intestate exercised due care. If no positive testimony could be procured, proof of circumstances which excluded any act of contributory negligence would have been sufficient. Prince v. Lowell Electric Light Corporation, 201 Mass., 276, 281, and cases cited. But if we turn to the testimony covering the period elapsing after the time she left the house of a friend shortly before midnight, and the next morning when between 8 and 9 o'clock she was found in her bedroom lying on the bed partially dressed, and although living and partially conscious, yet speechless from poisoning by illuminating gas, from the effects of which she steadily sank and died without recovering further consciousness, the most careful scrutiny reveals nothing as to her movements and conduct. If from the various circumstances of her life, as they are disclosed, there may have been no motive for suicide, and the suggestion that she died by her own hand could have been negatived by the jury, all else rests upon pure conjecture. The plaintiff very urgently contends that, whenever the decedent may have sought repose, she must have left the gas burning, as the electric lighting arrangement with which the burner was equipped did not appear to have been defective, and the flow of gas from the jet, when the condition of affairs in the room was first discovered, continued unchecked. The fact, however, sought to be proved is, that neither by any careless act of commission, nor omission, did the decedent contribute to the accident which caused her death. But when all the facts which the witnesses observed are given their full probative effect they fail to establish a connection with the conclusion which must be reached. If, upon retiring, the gas remained lighted, but was subsequently extinguished by the insufficient pressure owing to the change of mains, or if in using the electric lighter by which the gas was not only ignited, but turned off, and which when set would not show from any observation of the fixture itself whether the gas was on or off, she in some way failed to stop the flow either wholly or partially, or if having effectually done so, she then inadvertently switched the gas on again, are all mere assumptions. In this realm of speculation, where all theories necessarily end in supposition, neither hypothesis is exclusive, nor can it conclusively be inferred that one is more probable than another. French v. Sabin, 202 Mass., 240. The action, therefore, cannot be maintained. Exceptions sustained.

Items of Interest
FROM VARIOUS LOCALITIES.

Vice-President Storms informs us that the stock of the Amarillo (Tex.) Gas Company has been increased to $100,000 from $50,000, all paid up. He adds: "We are preparing for a campaign for new business, and expect to make a good showing on the result of the same." Mr. Storms was an interested attendant at the Gas Show, which he admitted had caused him to add largely to his belief that gas was, more than ever, the light of the present.

The annual meeting of the New Haven (Conn.) Gas Light Company will be held to-day. No change will be made in the executive management.

The excellent examples of arc lighting by gas recently put in evidence before the business headquarters of the Keene (N. H.) Gas and Electric Company, are seemingly attracting sleighing parties from all parts of the outlying country. So argues one of its officers, who bases his judgment on the fact that having inspected the illuminating effect, the parties invariably drive right out-of-town.

The latest whirl in the business doings of McAlester (Okla.) seems to be that the capitalization of the McAlester Gas Light Company has been put at $500,000, and that Messrs. F. C. Dean and Wright Smith, of Grand Rapids, Mich., are largely interested in its fortunes.

The proprietors of the Easthampton (Mass.) Gas Company have decided to construct an auxiliary steam plant on Liberty street.

Mr. Arthur U. Cantril, formerly of Denver, Col., and who has been in Spokane Falls, Wash., for some months, rearranging the affairs of the Spokane Company, since the latter came into the possession or control of Mr. Henry L. Doherty and associates, has been made General Manager of the Company. This speaks pretty well for a man of 35 years, who 6 or 8 years ago was a meter reader on the staff of the Denver Company.

On the 28th of September last the Bartlett-Hayward Company, of Baltimore, Md., signed contract to construct a gasholder, to be in 2 sections, each virtually 58 feet in diameter, for the Newburyport (Mass.) Gas and Electric Company. The holder was to be ready for use December 20th. It was put in actual work December 18th.

The residents of Schaefferstown, Pa., have petitioned Superintendent Charles E. Clark, of the Myerstown Gas and Fuel Company, to extend the main system thereof to and through their district.

We are informed that the Burlington (Ia.) Gas Company has agreed to put the net selling rate at $1 per 1,000 cubic feet.

At the annual meeting of the Fredericksburg (Va.) City Council, Mr. B. F. Bullock was re-elected Superintendent of the City Gas Works.

Mr. William T. Morris and associates have secured complete control of the Electric, Heat, Light and Power Company, of Newark, N. Y. The gas interests of Newark have for some time been in the control of the Morris syndicate.

The Massachusetts Board of Gas and Electric Light Commissioners has approved the application of the terms under which it is proposed by the Edison Electric Illuminating Company, of Brockton, to absorb the Bridgewater Electric Company.

Mr. J. C. Vance, who has been appointed Manager of the Southern Indiana Gas Company's office in Shelbyville, Ind., has removed his belongings from Anderson, Ind., and is now a resident of Shelbyville.

The Directorate of the Nashville (Tenn.) Gas Light Company has been increased to 15 members. The new plant of the Company is said to be working satisfartorily.

Mr. Warren E. Howell, whose connection with the properties dates from 1904, has resigned the position of General Manager of the Hamilton (O.) Otto Coke Company and of the Hamilton Gas and Electric Company. The resignation took effect January 1st. He will continue to reside in Hamilton.

PRESS despatches, dated the 26th ult., were to the effect that Mr. Benjamin S. Howell, Manager of the Grand Rapids City Railway Company, has announced the formation of a merger of certain traction, power and gas interests in Michigan, by the Hodenpyl-Walbridge interests of New York and E. W. Clark, of Philadelphia. Properties in Grand Rapids, Saginaw, Bay City, Flint, Kalamazoo, Jackson, Cadillac and Pontiac are concerned, but the Grand Rapids City Railway Company and the Grand Rapids-Muskegon Power Company are the principal properties concerned in the turnover. It is further suggested that the deal foreshadows a comprehensive development of Michigan water power and the ultimate (perhaps near) completion of a traction line between Detroit and Chicago, by way of Jackson and Ionia, Mich.

"R. V. S.," writing from Montreal, Canada, under date of the 24th ult., incloses this: "Judge Fortin has dismissed the petition for injunction applied for by the Montreal Light, Heat and Power Company against the town of Maisonneuve and the Dominion Light, Heat and Power Company. The petition asked that the town restrain the respondent Company, or any other Company, from placing wires or poles for lighting in Maisonnueve for a period of 20 years, from January 26,1900. The petitioners claimed that, by an arrangement between Maisonneuve and the Royal Electric Company, afterwards transferred to the Montreal Light, Heat and Power Company, they had exclusive right to place poles on wires for lighting in the town of Maisonneuve. Judge Fortin dismissed the petition, however, contending that by charter the respondent Company had the right to place wires for heating under their charter, even against the consent of the town of Maisonneuve. The petitioners further had not established that they had exclusive use and occupation of the streets and squares of the town, and there was no proof that the poles and wires of the Dominion Company damaged those of the petitioners. The town of Maisonneuve did not contest the application."

THOS. R. LAIRD, writing from Philadelphia, Pa., under date of the 26th ult., incloses this from the *Inquirer*, of that city, dated the day named: "The Atlantic City Company has been incorporated under Delaware laws by C. H. Geist, to become the holding Company for the Atlantic City Gas Company, to be organized, and which will operate the properties of the Atlantic City Gas and Water Company and the Consumers Fuel and Gas Company, recently purchased by Mr. Geist. The capital of the Atlantic City Gas and Water Company is $750,000 stock and $80,000 bonds. The Consumers Fuel and Gas Company has $700,000 stock and $1,000,000 bonds. The capital of the Atlantic City Company is $5,000,000 common stock, and $1,000,000 preferred stock and no bonds. Of this $800,000 of the preferred and all of the common stock is to be issued in exchange for securities of the Atlantic City Gas Company, the second new Company, which will be the operating Company under the Atlantic City Company. The capital of the Atlantic City Gas Company will be on the basis of $4,000,000, including bonds and stock. The officers of the Atlantic City Company are: Clarence H. Geist, President; Joseph A. Slattery, Vice-President; C. W. Fox, Secretary, and I. C. Elston, Jr., Treasurer. The Directors consist of the officers and Edmund Mitchell, Jr., of Wilmington, Del."

WE are more than pleased to note that the press despatches, dated the 22d ult., which announced that Mr. John Stahl, Assistant Superintendent of the gas works at Fort Plain, N. Y., had been fatally injured by a gas explosion, which also did much damage to the works, were inaccurate. The facts are: There was a violent explosion of gas in the purifying room, that did much damage to the building and Mr. Stahl was injured rather seriously; but he will live for many a day in so far as the current ill-happening at the plant is concerned.

OWING to changes in the proprietorship of the Easthampton (Mass.) Gas Company, and likely owing to his desire to reap the quietude of rest from business cares, Mr. George L. Manchester has retired from the dual positions of Treasurer and Superintendent. He was for many years in its service.

DURING the meeting of the American Gas Institute, in New York city, last year, an accident occurred to one of the members while crossing Broadway at 42d street. It was thought that the victim was Mr. John McIlhenny, of Philadelphia, but the actual sufferer was Mr. C. W. Townsend, Secretary of the Chaplin-Fulton Manufacturing Company, of Pittsburgh, Pa. Mr. Townsend's injuries were severe enough to cause him remaining in the Flower Hospital for 2 months. Besides the severe shock generally to his system a leg was broken in two places—and the sufferer is by no means a youngster. While crossing 42d street he was struck by s taxicab travelling at a high rate of speed, and thrown. On returning home, Mr. Townsend instituted suit for damages against the Hester Taximeter Cab Company, and last week the case came on for trial before Judge Hart and a jury in the Federal Court. The jury rendered a verdict in favor of Mr. Townsend in the sum of $3,790. We cannot congratulate him on the money end of the verdict, since he would not undergo a similar experience for all the money that ever was made, but we decidedly congratulate him on the stand taken by him, involving, as it did, much time, expense and trouble, for such punishments are likely to deter some of the reckless operators of automatic travelling machines, whose disregard of the rights of pedestrians is little short of wonderful.

MR. J. C. MCQUESTON, Manager of the Westinghouse Companies Publishing Department, is certainly to be congratulated over the beauty and completeness of his efforts which have resulted in the "Westinghouse Diary" for the current year. Much new matter has been added to the usual compilation, and in fact the diary (still retaining its proper shape for recognition as a vest pocket book) might without stretching the titling been called a text book.

THE Gas Bench Construction Company, of St. Louis, Mo., writing under date of the 23d ult., said:

To the Editors AMERICAN GAS LIGHT JOURNAL: "We note, in the issue of your publication dated December 20th, p. 1342, an article relative to 'Progress Made in the Gas Industry During the Past 12 Months,' in which reference to vertical benches is made. It names 3 installations of verticals built during the past year, which it is further stated were apparently all failures. We, however, wish to state that we built the benches at Columbia, Mo., and the same were successfully operated from the start, and are now in successful operation. It is, however, true that those benches were shut down for several months, as the original retorts placed in the same were made of a material not well suited for the purpose, and had to be replaced. The new retorts were made of a material especially adapted for verticals, and the benches have been in successful operation ever since the new retorts were installed. We believe that the benches at Columbia are the only ones operating successfully in the United States, and no doubt the above statements will be of interest to your readers."

REPLYING to "A. J. L.," the executive management of the Anderson (S. C.) Gas Company, as the same stood the 27th inst., is: Directors, A. Medwedeff, Geo. C. Thompson and Townsend & Blake, of Trenton, N. J.; E W. McGee, of Spartanburg, S. C., and B. F. Martin, of Anderson; President, A. Medwedeff; Secretary and Treasurer, Geo. C. Thompson, of Spartanburg.

BETTER write to "The Gervaise Press," 31 Exchange street, Rochester, N. Y., for a copy of its circular announcing the prospectus of the volumes, now in course of final preparation by Dr. Delos F. Wilcox, Chief of the Bureau of Franchises, Public Service Commission, New York City District. It is altogether unnecessary to here dilate upon the peculiar ability of Dr. Wilcox to write upon these matters, since that is not only admitted but is taken as unquestionable. However, "Municipal Franchises" is to be published in 2 volumes of 720 pp. each, and it will contain "A detailed description of the terms and conditions upon which private corporations enjoy special privileges in the streets of American cities." The price per volume is $5, net, each, save in the instance of orders submitted by the 15th inst. (the date set for publication), which will be filled at $4 each.

MR. J. W. RUSER, formerly of Cincinnati, O., has been appointed local Superintendent of the United Fuel Gas Company's plant at Huntington, W. Va.

MR. WM. B. MCDONALD, formerly General Manager of the Evansville (Ind.) Gas and Electric Light Company, has been appointed General Manager of the Public Service Company, of Evansville.

MR. P. W. HAMMOND, Manager of the Boonton (N. J.) Gas Light and Improvement Company, was very much surprised and greatly pleased over an incident that interrupted the even tenor of his way not long ago. One afternoon in late December he was invited to appear before the Board of Directors, which he did under a state of mind more or less perturbed. The spokesman for the tribunal commenced the interview by telling the way in which his superiors held him, and the annunciation was brought to a close by the passing over to him of an opal scarf pin, surrounded by small brilliants.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHARLES H. WADELTON,
MANAGER.

MONDAY, JANUARY 3, 1910.

The Market for Gas Securities.

The general tendency of Consolidated was towards strength since last reporting. It got above 160 yesterday (Wednesday), and the opening to-day (Thursday) came in at 159½ to 160. All indications that appear favor an advance of moment over current rates for Consolidated. City gas bonds are in good demand.

Brooklyn Union got beyond 150 this week, and 151 is bid to-day, holders asking an advance of ¼ point. All will be sorry over the news that President Jourdan is indisposed. In fact for a brief spell it was thought his condition was really serious, but the reserve power which he possesses in a truly remarkable degree carried him speedily from the danger point. Massachusetts Gas Companies (common and preferred) are going along evenly; Peoples, of Chicago, is 115½ bid.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JANUARY 3.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$78,177,000	100	159⅞	160
Central Union Gas Co. —				
1st 5's, due 1972, J. & J.	3,000,000	1,000	98	101
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	2,500,000	100	155	165
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	101½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	100	101
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	104	107
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	94	100
Standard	5,000,000	100	—	75
Preferred	5,000,000	100	70	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	151	151½
1st Con. 5's, due 1948, M. & N.	15,000,000	—	95	99
Yonkers	200,650	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	1	1½
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	500,000	1,000	90	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	73	73¾
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,000,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	20,500,000	100	92	93
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,662,750	100	90¼	91
Preferred	3,036,500	100	75¼	80
Consumers, Toronto	2,000,000	9	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,600,000	—	—	118
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	458,000	—	102	105
Detroit City Gas Co	5,000,000	50	—	50
" Prior Lien 5's	4,612,000	1,000	97	100½
Detroit Gas Co., 5's	881,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	30	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104⅜	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	112	113½
" Bonds, 5's	10,500,000	—	108	108⅜
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis.	10,000,000	100	104	105
Preferred	2,500,000	100	—	98
Bonds	10,000,000	1,000	104	—
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¼
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	82½	83
Preferred	25,000,000	100	92¾	93
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	6,000,000	—	137	138
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	114½	115¾
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104⅜	105¼
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.—				
1st Mtg. 5's	751,000	1,000	100	102
St. Paul Gas Light o.	1,500,000	100	45	47
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112¾	115
General Mortgage, 5's	2,465,000	1,000	90	95
Syracuse Gas o., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	100	104
Washington (D. C.) Gas Co.	1,600,000	200	361	362
1st Mortgage, 6's	600,000	—	—	—
Western Gas o., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas o.	600,000	50	261	—

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Western Gas Construction Co., Fort Wayne, Ind..... 48

(*Continued on page* 18.)

SPECIAL MEETING.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, December 9, 1909.

A Special Meeting of the Stockholders of The United Gas Improvement Company will be held at the office of the Company, Northwest Corner of BROAD AND ARCH STREETS, PHILADELPHIA, on Wednesday, Feb. 9, 1910, at 12 o'clock, noon, for the purpose of acting upon the subject of a proposed increase in the authorized capital stock of the Company from 1,009,467 shares, of the par value of $50 each, to 1,110,414 shares, of the par value of $50 each.

By order of the Board of Directors.

W. F. DOUTHIRT, Secretary.

The stock transfer books will be closed from 3 P.M., Jan. 28, 1910, until 10 A.M., Feb. 10, 1910.

1801-9

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Dec. 8, 1909.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Jan. 15th, 1910, to stockholders of record at the close of business, Dec. 31, 1909. Checks will be mailed.

1801-5 LEWIS LILLIE, Treasurer.

Situation Wanted.

A first-class prover and repairer of meters, having 10 years' experience in all branches of the meter business, would like to take charge of repairs with a gas company, situated anywhere (home or abroad), requiring the services of a thorough workman along the lines indicated. Good references.

1803-2 Address, "REPAIRER," care this Journal.

Position Wanted

By man 30 years old, now employed as manager of small plant in Wisconsin. Have had 12 years' experience in bookkeeping and accounting; 6 years in the gas business. Willing to go anywhere as head bookkeeper, assistant manager or superintendent in town of 25,000 or over after January 1st, 1910.

1803-3 Address, "MIDDLE," care this Journal.

Position Wanted.

A young married man of 26 years of age, sober and reliable, desires position as water gas maker. Capable of doing everything about the works. Now employed in a large plant. Can furnish any references that may be required. Ten years' practical experience.

Address, "GENERATOR,"

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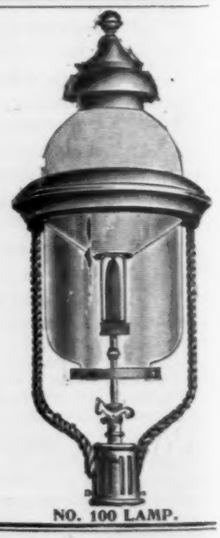

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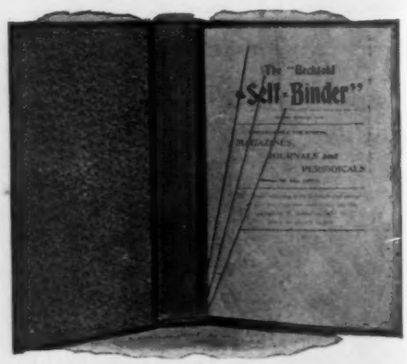

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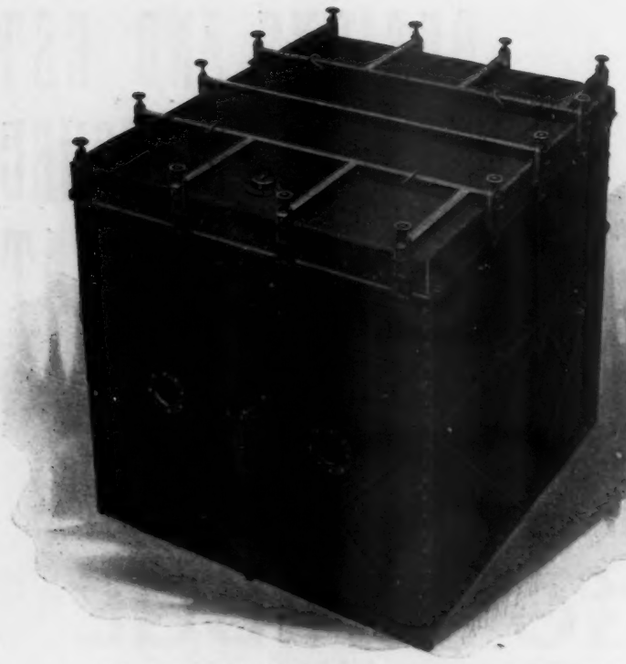

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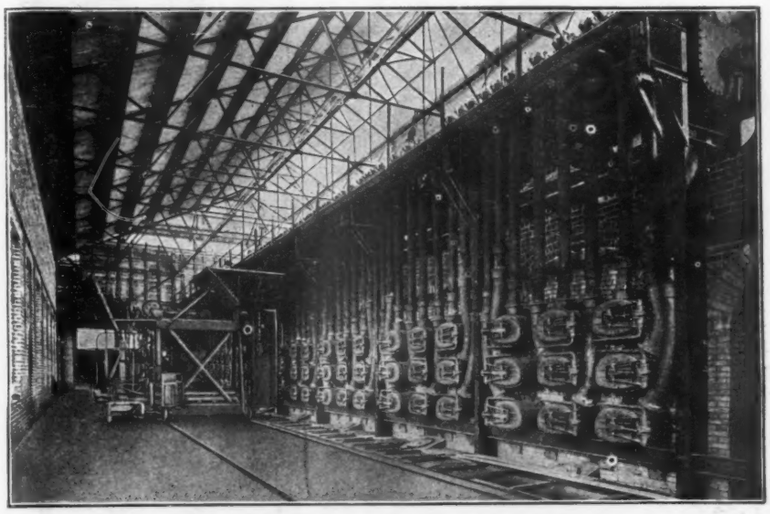

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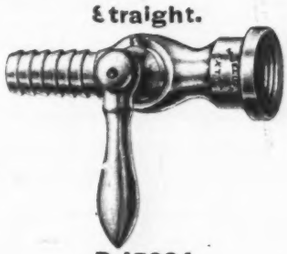

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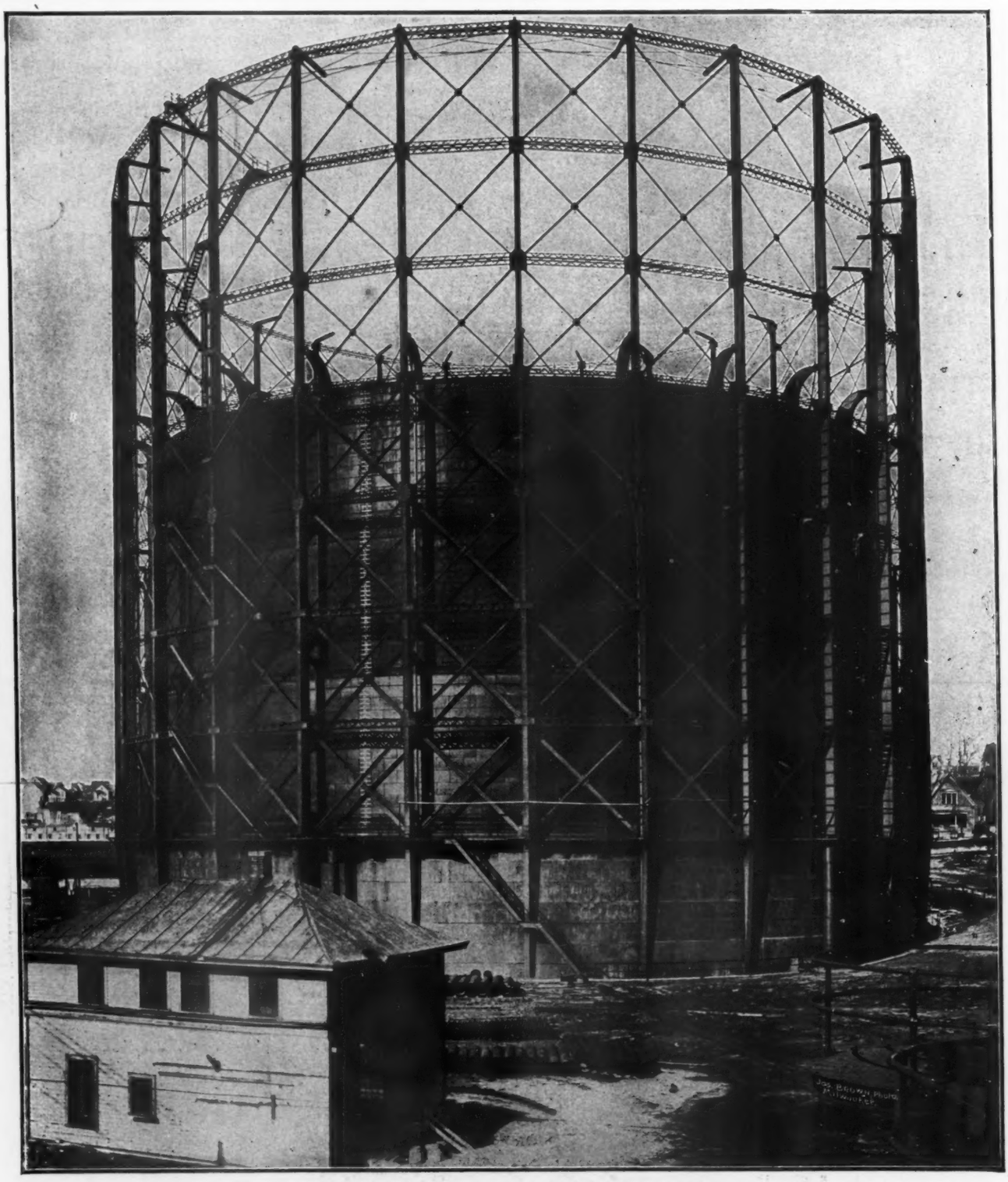

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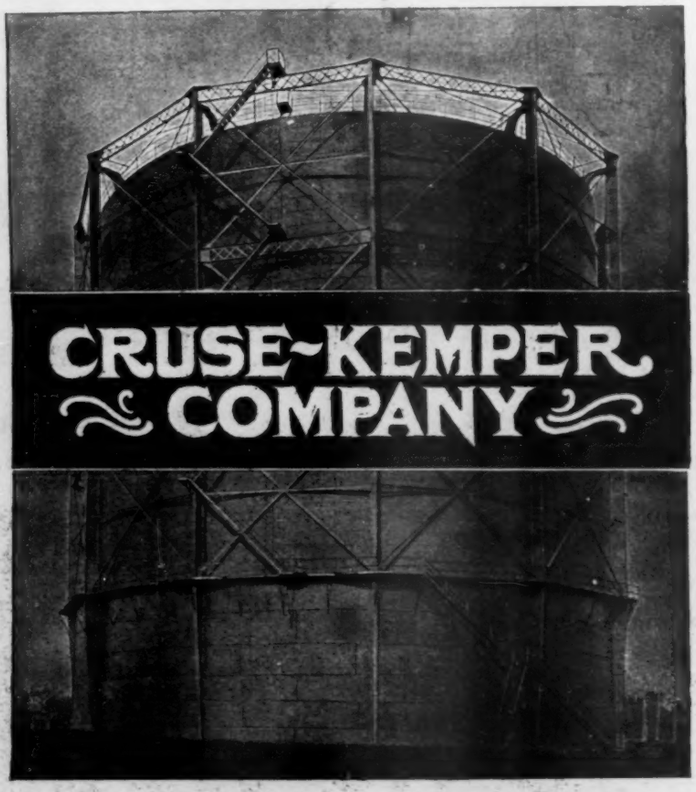

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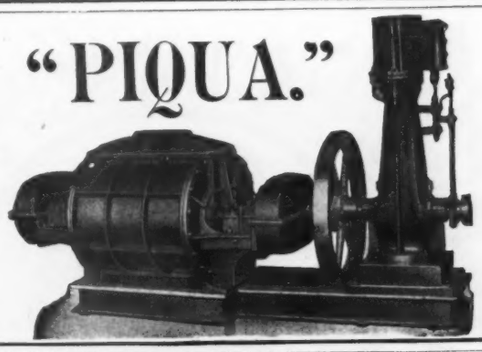

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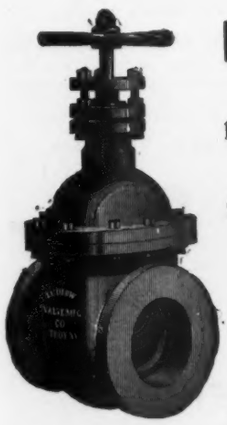

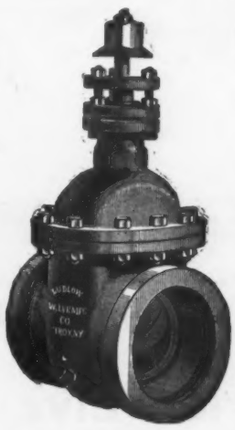

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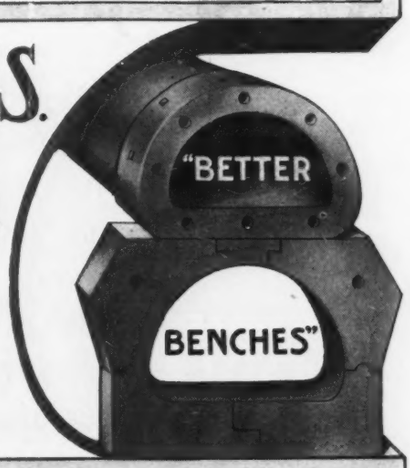

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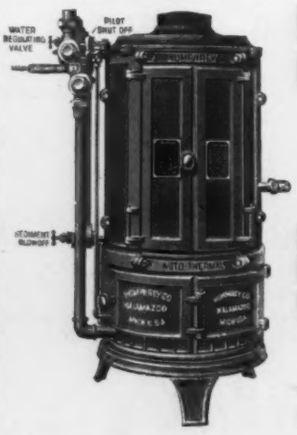

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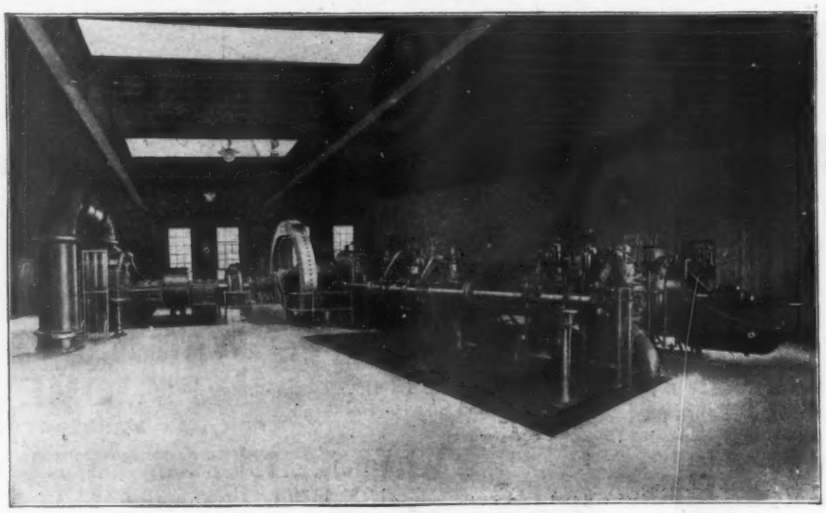

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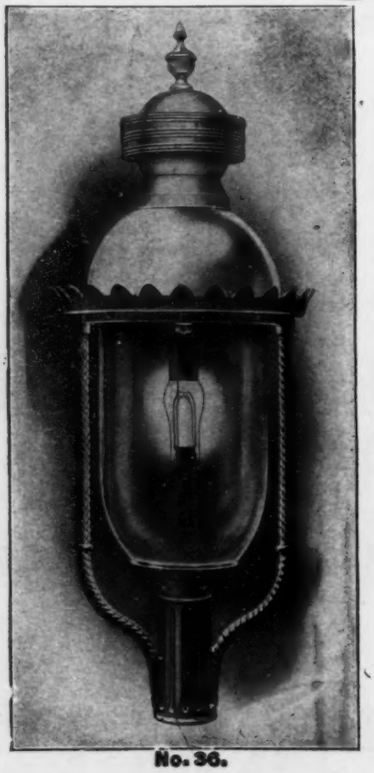

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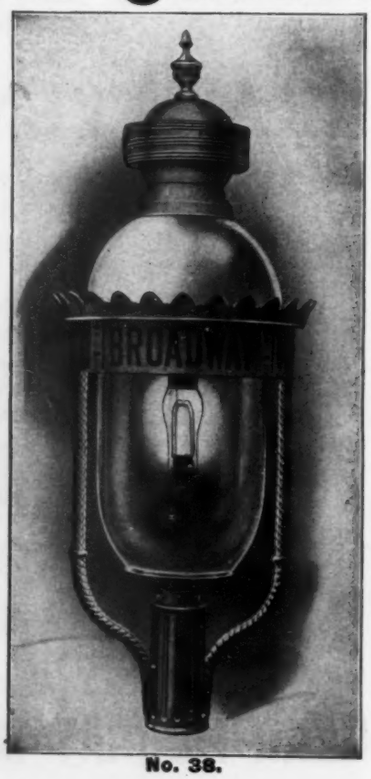

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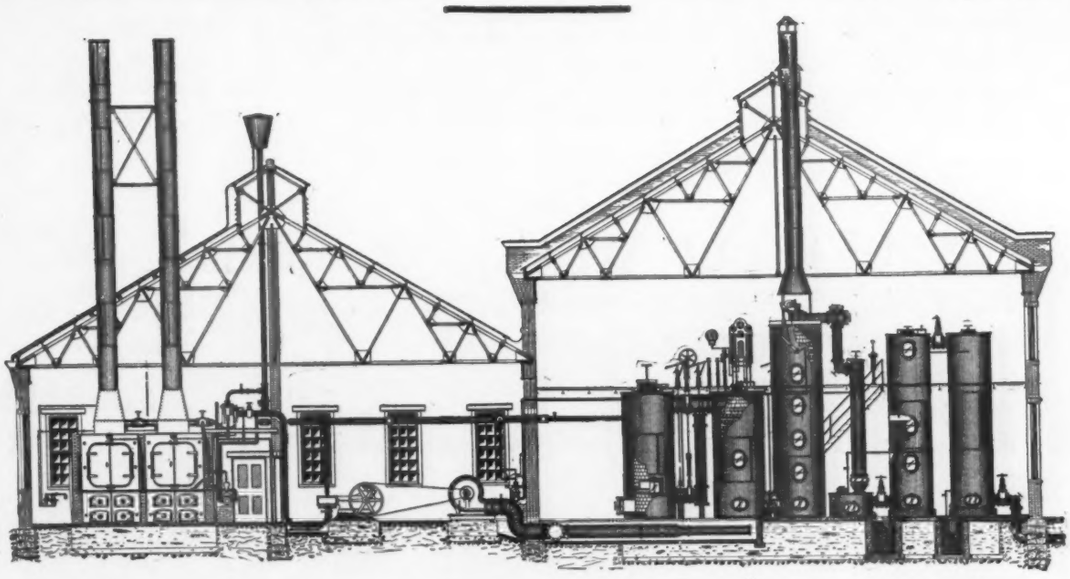

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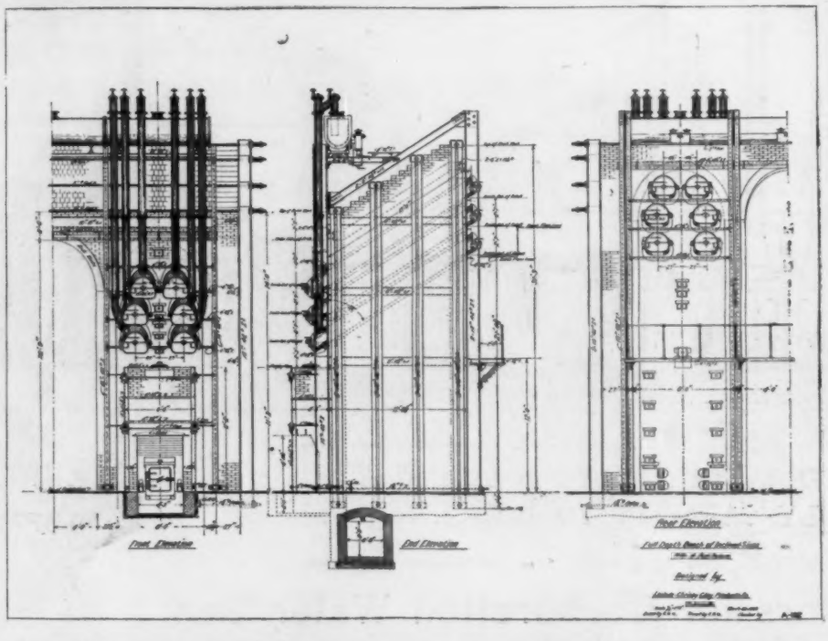

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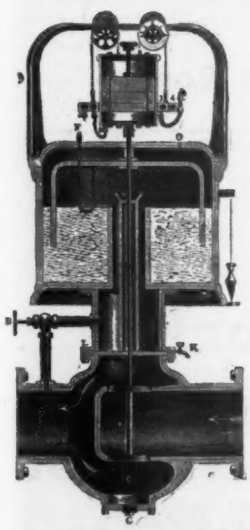

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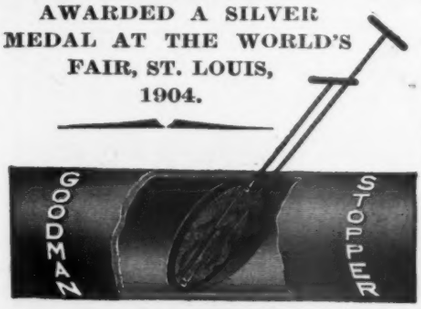

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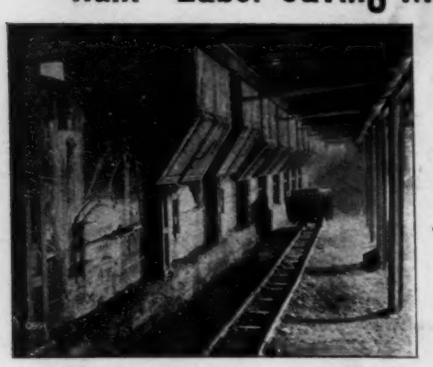

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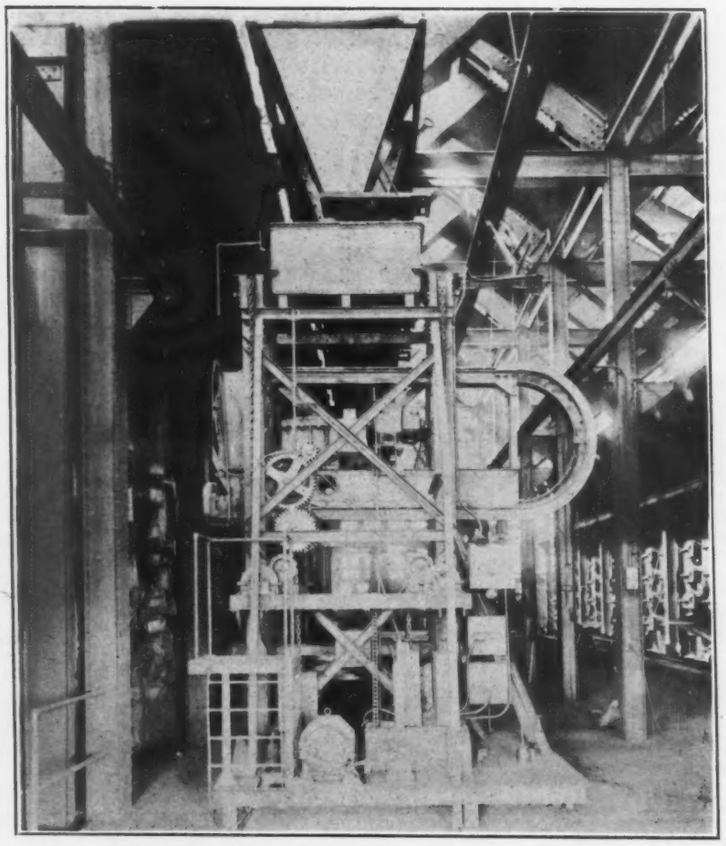

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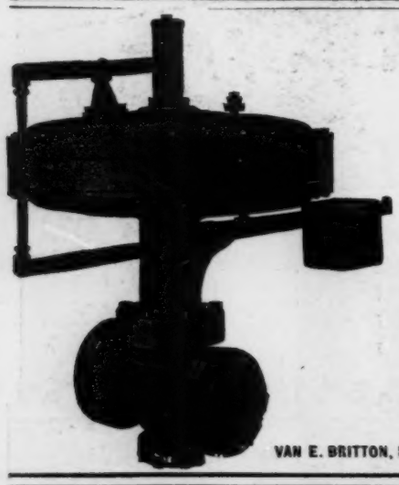

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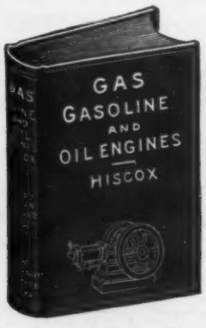

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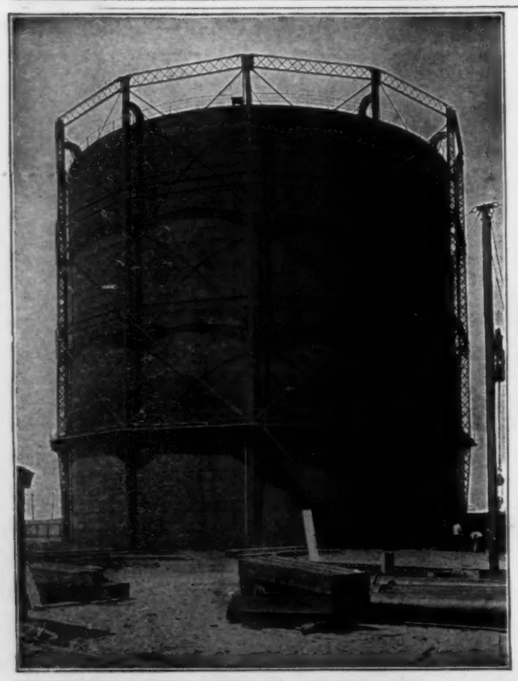

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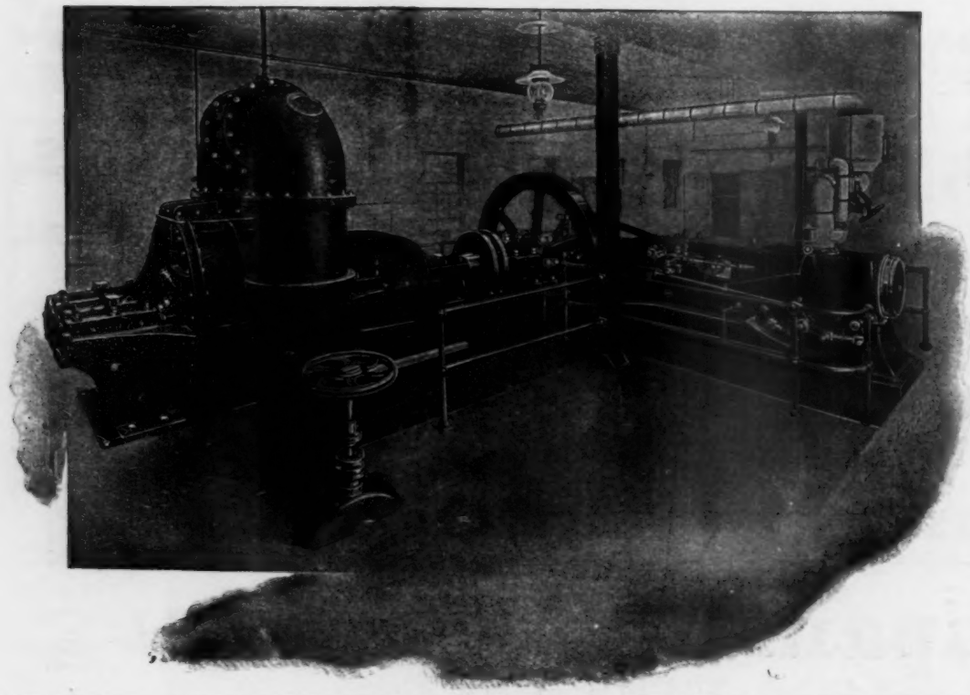

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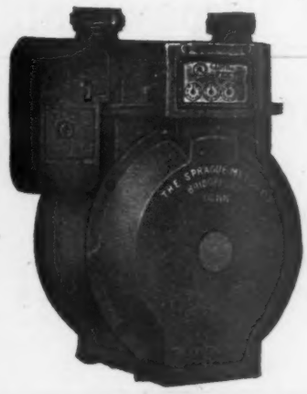

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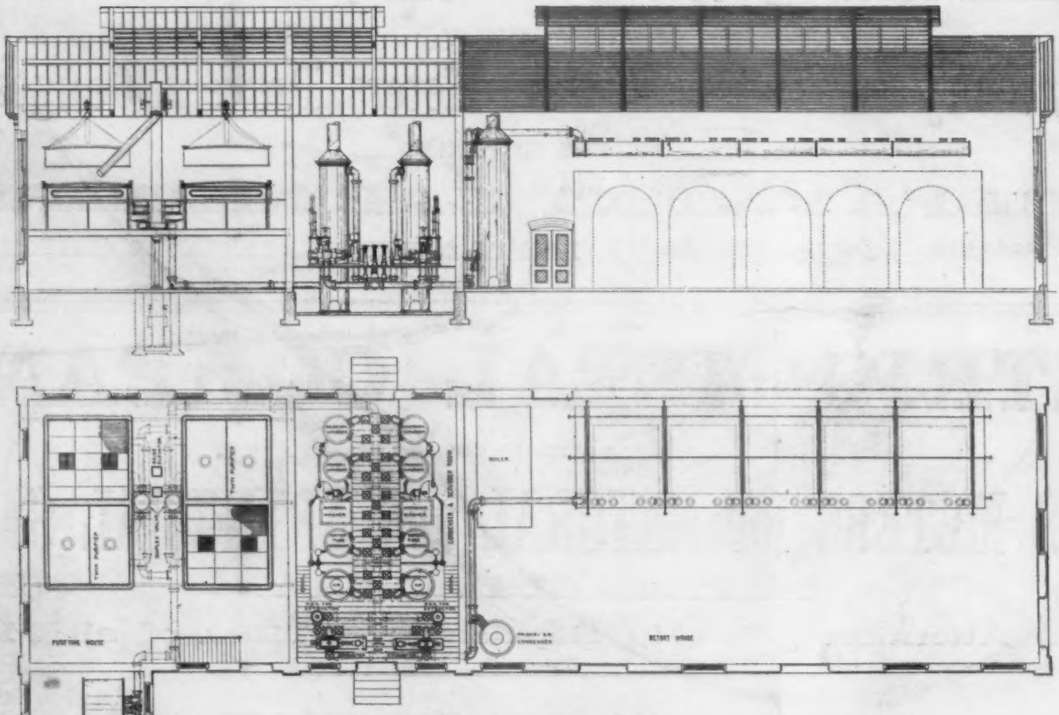

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